The Foundry

VOLUME 65 • NUMBER 6

Editorial Staff

FRANK G. STEINEBACH
Editor

PAT DWYER
Engineering Editor

EDWIN BREMER
Metallurgical Editor

New York . . . B. K. PRICE, L. E. BROWNE
Chicago . . . . . W. G. GUDE
Detroit . . . . . A. H. ALLEN
Pittsburgh . . . . D. R. JAMES
Washington . . . . L. M. LAMM
London . . . VINCENT DELPORT

Advisory Staff

JOHN W. BOLTON
ALBERT E. GROVER
JOHN HOWE HALL
N. K. B. PATCH
HARRY A. SCHWARTZ

Business Staff

J. M. LATHROP
Advertising Manager

G. A. POPE
Assistant Advertising Manager

New York . . . . J. F. AHRENS
Chicago . . . . . L. C. PELOTT
Pittsburgh . . . . S. H. JASPER
Cleveland . . A. L. KLINGEMAN

BRANCH OFFICES

New York . . . . 220 Broadway
Chicago . . . Peoples Gas Building
Pittsburgh . 1650 Koppers Building
Washington . National Press Building
Detroit . 1010-2 Stephenson Building
London . . . . . Caxton House
Westminster, S.W.1

THE FOUNDRY is published monthly on the 15th of each month by The Penton Publishing Co., Penton Building, 1213 West Third street, Cleveland, Ohio. JOHN A. PENTON, Chairman, Board of Directors; E. L. SHANER, President and Treasurer; J. R. DAWLEY and G. O. HAYS, Vice-Presidents; F. G. STEINEBACH, Secretary.

Subscription: United States and Mexico, $2.00 a year; Canada, $3.00 a year; Great Britain and other Foreign Countries, $4.00 a year; single copies, 25 cents. Copies published three months or more previous to date of current issue, 50 cents each. Entered as second class matter at post-office at Cleveland under the act of March 3, 1879.

Copyright 1937, by the Penton Publishing Co.

Member: Audit Bureau of Circulations, Associated Business Papers, National Publishers Association.

Contents for June, 1937

	Page
EDITORIAL	21
PROGRESS MADE IN AUTOMOTIVE CAST IRONS By Harold S. Austin	22
PATTERN AND GATING DESIGN FOR BRONZE CASTINGS By Harold J. Roast	24
ANCIENT CHINESE CASTINGS By Thomas T. Read	27
GREAT LAKES EXPOSITION PLANS A. F. A. DAY	28
SWEEP ALUMINUM PATTERN FOR IRON BASE By J. H. Eastham	29
YOU CAN CHANGE THE WEATHER By R. Campbell Wellman	30
SHOWS LIGHTED VENT FALLACY By A. J. Cassista	32
PREVENTION OF SILICOSIS THROUGH ENGINEERING CONTROL	33
SPECIAL PIG IRONS IN THE FOUNDRY By Edwin A. Jones	35
QUESTIONS AND ANSWERS	36
MEN OF INDUSTRY	40
NONFERROUS PROBLEMS EVOKE LIVELY DISCUSSION	48
PROPERTIES OF MALLEABLE ARE INVESTIGATED	53
STUDY REFRACTORIES AND THEIR APPLICATIONS	54
FOUNDRY COST METHODS RECEIVE ATTENTION	56
DISCUSS MOLDING SAND AND CORE BAKING	59
VIEWING FOUNDRY DEVELOPMENTS AT SHORT RANGE	60
THE ADVENTURES OF BILL By Pat Dwyer	62
CAST IRON FORUM FEATURES MEETING OF PORCELAIN ENAMEL INSTITUTE	66
BRITISH IRON AND STEEL INSTITUTE STUDIES INGOT MOLD MAKING	68
EUROPEAN FOUNDRY PRACTICE	89
OBITUARY	90
NEW EQUIPMENT FOR FOUNDRIES	92
FOUNDRY ACTIVITIES	96
NEW TRADE PUBLICATIONS	100

and you can tell PACK uses

ASK THE MAN WHO MAKES THEM

FOUNDRIES called foundries that can foundries that must quality of cores and Linoil by the found your own foundry.

THE WERNER G.

ADVERTISING PAGES REMOVED

The Foundry

Industry Must Prepare For Wage-Hour Law

AFTER months of speculation, industry is permitted a partial inspection of the NRA substitute in the Black-Connery fair-labor standards bills now before congress. While in all probability a majority of industrialists favors the major objectives claimed for the program, already having eliminated child labor and established maximum hour and minimum wage schedules closely approaching those favored by the National administration, industry has reason to oppose some of the methods proposed for accomplishing the objectives. Chief criticism has been directed against the idea credited to certain members of congress to use the proposed law as a measure of spreading work.

Briefly, the bills propose to set up mandatory standards for minimum wages and maximum hours for enterprises engaged in interstate commerce; to prohibit child labor in occupations declared to be hazardous by the Labor Standards board; and to prohibit employment of strike breakers during labor controversies. A Labor Standards board, composed of five members appointed by the President and confirmed by the senate, will carry out the functions of the act.

Administration of the laws proposed in these bills should be deliberate and the ground work should consume considerable time, in contrast to the confusion and uproar which followed the enactment of NRA. The bills provide that the Labor Standards board shall declare the provisions applicable as rapidly as it sees such provisions can be applied without curtailing unreasonably the earning power of employes. Wage and hour provisions will be made applicable only after hearings by the board.

Specific designation of wages and hours, which was not included in the bills will result in considerable debate. While numerous changes will be made in the text, it is probable that a law will be enacted with provisions similar to those incorporated in the Black-Connery bills. As revealed in the poll conducted by the American Institute of Public Opinion, a convincing majority of the public believes the measure is desirable. Also, congress has not yet reached the point where a revolt will succeed, as was illustrated by the passage of the relief measure demanded by the administration.

Therefore, industry must prepare to meet the situations as they arise. Each group must have available complete data on essential matters, so that when the time comes for the hearings before the Labor Standards board, the best possible case may be made. Unless a united front is presented by each of the four groups in the foundry industry, a rude awakening surely will follow. Foundrymen should remember that Washington is not providing a stop gap to meet an emergency. The proposed measure looks toward a permanent solution of a definite problem.

Opportunity Deserved

FOUNDRYMEN here and there appear to be having difficulty in providing foremen and other supervisors to handle present day production. It is just barely possible that they cannot see the trees for the forest.

While employes with sufficient knowledge and an understanding of the company's particular production problems are passed over, men, with no better training, are secured from the outside. An individual's capabilities cannot be tested until he is given an opportunity. At the same time, the grass may not be greenet on the other side of the fence.

A careful study of the plant personnel may reveal unexpected qualifications for leadership, and thereby solve one particular problem arising from the shortage of trained men.

Frank G. Steinebach
Editor

Progress

By
HAROLD S. AUSTIN

Foundry Metallurgist
Buick Motor Division,
General Motors Corp.
Flint, Mich.

This is the first of two articles abstracted from a paper presented recently at the Saginaw Valley Group meeting of the American Society for Metals.

TWENTY years ago, or even less, the standards of quality for automotive cast iron were not established and knowledge on the subject was limited. Since that time much study has been devoted to the subject, and with research and practical experience, considerable knowledge has been obtained in regard to the characteristics of automotive cast iron and their relation to the service record of the casting.

This has led to the fixing of standards which have proven their value in a substantial way as witnessed in improved quality and durability. Even so, there still exists quite a divergence of opinion as to the best compositions, alloys and furnace mixtures to be used in any particular casting. This must be accounted for by the explanation that there is more than one way to arrive at the same point.

Fig. 2—Pouring a mold

Iron Classified in Six Groups

The iron used in automotive castings may be grouped into not less than six general classifications. The requirements for many castings are so similar that naturally the classifications in many cases are related rather closely and may possess a multitude of minor modifications. As the practice and conditions in each automobile plant and foundry are different, so also are the classifications for the iron.

These irons may be classified into the following groups: 1—Cylinder iron; 2—Small parts iron; 3—Heat and growth resisting iron; 4—High test gray iron; 5—Piston ring iron, and 6—Miscellaneous compositions, such as used in camshamts, cylinder liners, valve set inserts, crankshafts, etc.

Cylinder iron is a close fracture gray iron, usually alloyed with chromium, nickel or molybdenum, or combinations of these metals This iron is constituted to give 185 to 210 brinell hardness in the bore. The composition is usually held within the following limits: Total carbon, 3.10 to 3.40 per cent; graphitic carbon. 2.50 to 2.80 per cent; combined carbon, 0.50 to 0.70 per

Made in Automotive Cast Irons

Fig. 3—Charging bucket entering cupola

cent; silicon, 1.80 to 2.40 per cent; manganese 0.50 to 0.80 per cent; phosphorus, 0.12 to 0.20 per cent; sulphur, 0.10 to 0.12 per cent; chromium, 0.10 to 0.50 per cent; nickel, 0.25 to 1.50 per cent and molybdenum, 0.10 to 0.70 per cent. The tensile strength runs from 35,000 to 40,000 pounds per square inch.

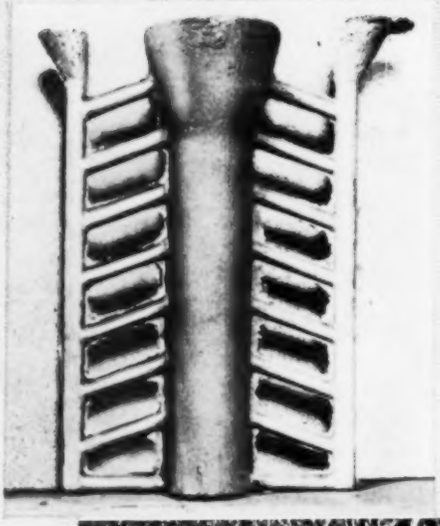
Twenty to 50 per cent of steel scrap is usually added in cupola mixtures. Foundry cokes with tendencies to lower carbon pick-up are preferable and chill depths are confined to ¼ to ⅝-inch. Compositions similar to the above prevent annealing of the bores and valve seats, have a completely pearlitic structure and possess excellent wearing qualities.

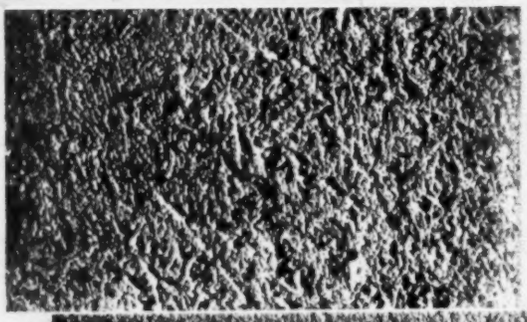
Castings of the following nature are generally poured from cylinder iron, cylinder blocks, cylinder heads, brake drums, cylinder liners, clutch plates, flywheels, etc. The chief characteristics required in this iron are good wearing qualities, strength, resistance to cracking, close fracture to prevent leaking and provide long wear, uniform hardness, and freedom from segregation

Small parts iron has a slightly more open fracture than cylinder iron when compared in the same cross section. The composition is higher in carbon, silicon and phosphorus. The carbon is usually held within the limits of 3.40 to 3.65 per cent; silicon, 2.35 to 2.55 per cent; manganese, 0.50 to 0.80 per cent; phosphorus, 0.25 to 0.40 per cent; sulphur, 0.08 to 0.12 per cent and nickel, 0.25 to 2.00 per cent. This iron has a brinell hardness of 150 to 175. The composition is close to that of the eutectic with silicon of the amount generally present.

The structural constituent is principally pearlite, and free ferrite is often present in locations which are subjected to annealing conditions during the cooling down after casting. It has a tensile strength of about 28,000 to 34,000 pounds per square inch. The silicon should be held as low as possible to avoid shrink cavities. The cupola mixture usually contains about 10 to 15 per cent steel scrap. A coke with fairly high pick-up should be used in melting, and chill depths are limited to from 1/16 to ⅛-inch on the test bar.

This iron should possess excellent fluidity to flow freely in thin sections, and it also should be readily machinable. Annealing commonly is practiced on many classes of castings. This iron is suitable for use in castings weighing from a few ounces to 40 or 50 pounds. Castings of the following (*Please turn to page* 71)





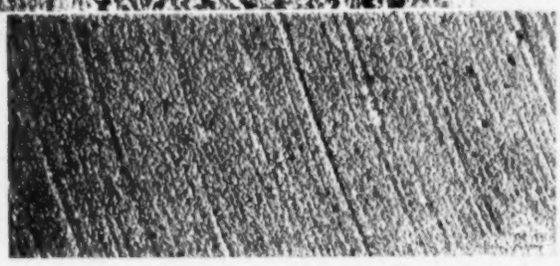


Fig. 1 (Top)—Successful method of pouring bronze stick to show uniform acid attack. Fig. 2—Macrograph indicating preferential acid attack. Fig. 3—Result of uniform acid attack

Pattern and Gating Design For Bronze Castings

By HAROLD J. ROAST
Vice President,
Canadian Bronze Co. Ltd., Montreal

This article is abstracted from a paper presented at the New England Regional Foundry Conference, held in Cambridge, Mass., April 9 and 10.

PRODUCTION of a satisfactory casting without cores, that is a casting that not only is sound and clean but will do the work or fit into the assembly required by the conditions in connection with which it is to be used, often is the result of considerable original and collective thinking of a number of persons.

Fundamentally the whole matter starts in the mind of the inventor. Such an one may have no knowledge of engineering or science of any kind. As a matter of fact many an inventor knows nothing and cares less for such modern advances. The inventor has the *Idea*. The next stage generally is developed by the mechanical engineer, who works up a design to make the idea practicable.

The next requirement is supplied by the patternmaker, whose duty it is to make a pattern that will enable the foundry to make a casting. Then comes the contribution of the metallurgist as to what metal or alloy will best suit the majority of factors concerned in the *Idea* originally conceived by this inventor.

The pattern is now ready for the foundry and the foundry, by consultation between the metallurgist and the molding superintendent, must decide on the kind of mold best suited to the job, whether chill cast or sand cast, and if the former, whether centrifugal or static chill, or if the latter, whether dry or green sand and the nature of said sand.

The vital question of gates and risers must be gone into, as also the temperature and rate of pouring, and whether directly into the sprue or indirectly by a basin. It is essential to the production of a casting that really fills as nearly as possible all the requirements of the idea, that none of the people mentioned decides on his contribution without consulting with all the others.

Final Result Represents Compromise

To elaborate further, the mechanical engineer must consider the requirements of the metallurgist in making his design. The metallurgist can supply him with the physical constants of a variety of alloys. It will probably be found that all the desired characteristics cannot be obtained in one alloy but the choice must be made of the one that meets the most important requirements. Ultimate strength may have to be sacrificed in part to toughness or both to hardness or all three, in a measure, to bearing quality, depending on the use to which the casting has to be put.

Choice of metal or alloy will have an influence on the pattern design. A pattern that can be cast successfully in steam metal may be fundamentally wrong for aluminum bronze. Again, the gates and risers and method of pouring also differ considerably for different alloys. Conditions of use may make special demands on the method of casting. For example castings gated and poured to withstand hydrostatic pressure may be entirely unsuitable for purposes of corrosion resistance, even where the same metal is used for both.

Then there is the economic side and the capacity in experience of the foundries available to do the work. If the question of price is uppermost, then an inferior metal may have to be used. Again, unless the available foundries have the necessary experience to enable them to handle any alloy, it may be better in the long

run to use a metal that is within the scope of their experience rather than an alloy more difficult to handle. A good casting and a less high grade alloy is better than an imperfect one of metal of intrinsically superior quality.

It may be felt that the author has said more about other things than pattern design for bronze castings but it is his opinion that there would be less trouble in most of life's activities if we would first of all get right down to fundamentals before we go into details. The telescopic should precede the microscopic. In every foundry organization, or for that matter, in any successful organization, some person has to have time to ponder. By the word "ponder" is meant "quiet thinking over a period of time."

Uniform cross-section is the prime requisite for a good pattern from the foundryman's viewpoint. Failing this then one having a gradual change from heavy to light sections. The underlying principle being that all parts of the casting shall be free to feed or be fed by the adjacent section. Freedom from heavy overhanging is desirable, as also, of course, any undercut sections that will prevent or hinder the drawing of the pattern from the sand.

Provide Ample Machining Allowance

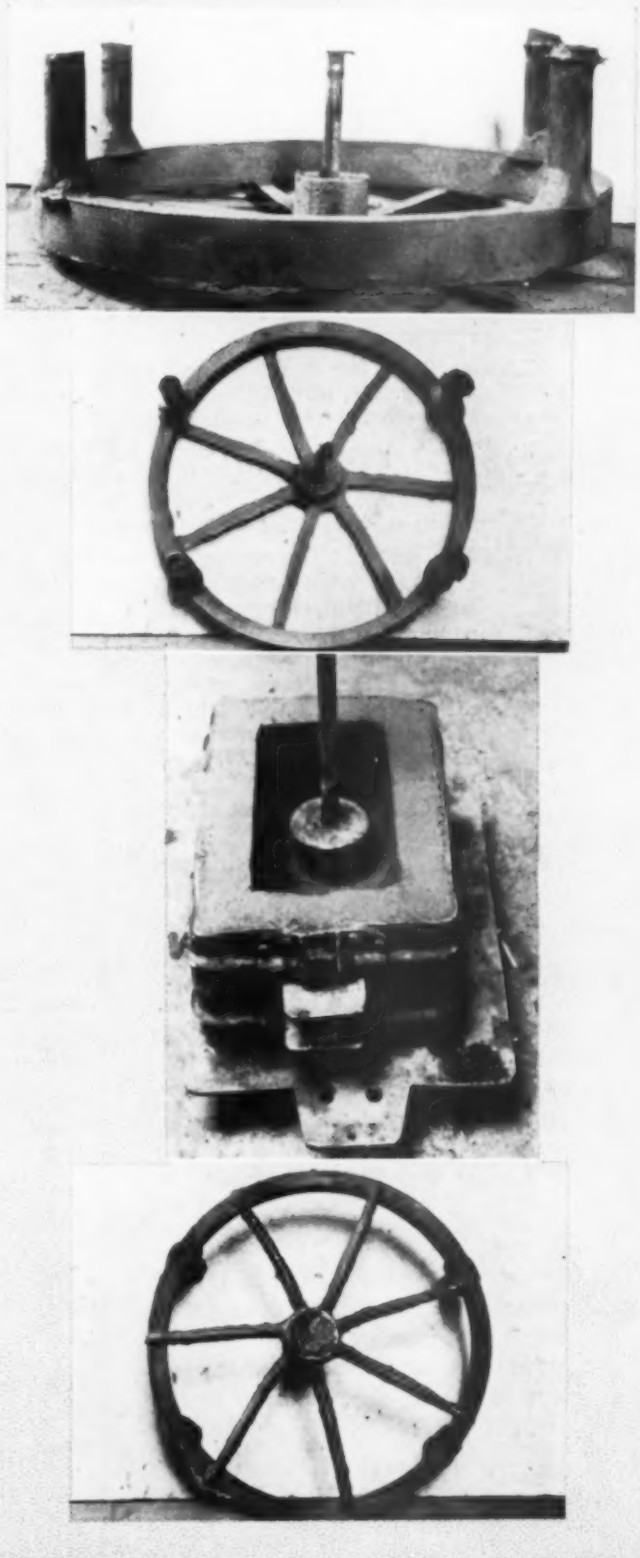
Provision for ample machining allowance is desirable. It is cheaper for the customer in the long run to have a little extra machining and get 95 out of 100 castings right rather than to have a minimum machining allowance and only get 75 good castings out of the 100 machined. Of course, this must be given consideration by the patternmaker in the first instance. Having in mind the various points raised so far, we will consider a few representative examples of patterns, castings and methods of gating requiring special treatment in the foundry.

Let us first of all take up the question of the control test bar pattern. The author has referred repeatedly to this question on various occasions but it still remains one of vital importance. If any foundry is to get the most out of its test bar work it is essential that cumulative data on the same kind of bar be obtained rather than a variety of constants on different patterned bars. The author has used the keel block pattern, shown in Fig. 8, for all brass and bronze alloys and, in fact for all nonferrous alloys except the aluminum and magnesium series. In the case of aluminum bronze the keel block is quenched in cold water 15 minutes after pouring.

This pattern gives a test bar that fulfills the only requirements of any test bar, namely information as to the quality of the metal going into the casting. Further, it provides three bars that give agreeing results in the hands of the foundry, the customer and, if required, an umpire. If used only in the foundry, it provides a bar for tensile test, one for Izod test and the keel bar for the compression test, general fracture and brinell.

The objection raised that such a pattern takes too much metal has, in the author's opinion, very little weight. It is not good practice to pour large castings with only *just enough* metal and, of course, if it is a matter of research, the question of the amount of metal is negligible.

It is the present intention to consider patterns for gates, sprues and risers, rather than the original patterns themselves. The casting of a plain disk is not remarkably easy if the alloy to be used is of high shrinkage and drossing proclivities. Fig. 9 shows nine ways of making a disk, only the last of which was successful. Notes on Fig. 9 are as follows:



Figs. 4, 5, 6 and 7—Various views of a successful method of pouring a ring to eliminate dross

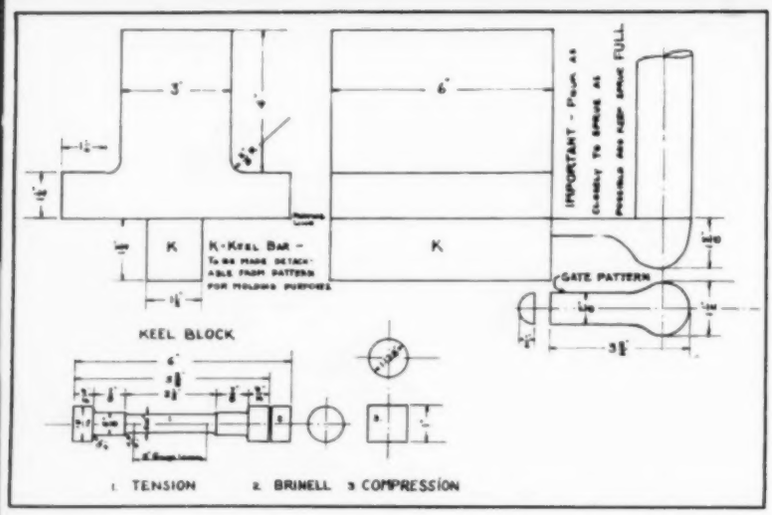


Fig. 8—Sketch of a keel block supplying three test bars for various purposes

1. Common direct gating. No provision for riser on casting. Dirt on cope side and shrinkage in cross-section central fracture.
2. Cast vertically to get away from dross. Dirt still there, as also shrinkage.
3. Same as No. 1, but smaller gate and a riser (riser wrong shape). Dirt still present. Fracture to one side of riser satisfactory.
4. Underneath approach. Metal was seen to squirt in, therefore dross. Fracture at side of riser satisfactory.
5. Gated as for architectural work with riser in center. Less dirt but not good. Fracture at side satisfactory.
6. Larger entry than 4 to avoid squirting and supposed dross trap at A. (This should have been upside down if it was to catch dross.) Same result as 4.
7. Same as No. 2 but with chills to offset shrinkage. Shrinkage overcome but dross still bad.
8. Principle is that of eliminating dross before metal enters casting. Shrinkage in central cross-section fracture, crack at base of riser, all due to wrong shape of riser. Mold tipped as indicated.
9. Same as 8, but correct shape of riser.

NOTE:—After 9 — Nineteen castings were made without dross, were shipped and found satisfactory. Temperature of pouring common to all at 2000 degrees Fahr. Green sand, Albany No. 1 and No. 0 mixed, blackened with highest grade plumbago. Molds tipped.

By a satisfactory casting in this instance was meant a plate free from dross or dirt either on the surface or elsewhere and having a uniform grain size as shown by fracture throughout all alterations of the cross-section.

To produce a 3-inch diameter stick of bronze 12 inches long that shall be perfectly sound not only as it appears on machining or sawing, but that will also stand up to the 10-minute deep etch test, is not an easy problem. By the deep etch test is meant the etching of the casting for 10 minutes in a mixture 3 parts nitric acid, 1 part hydrochloric and 1 part water, all acids being commercial.

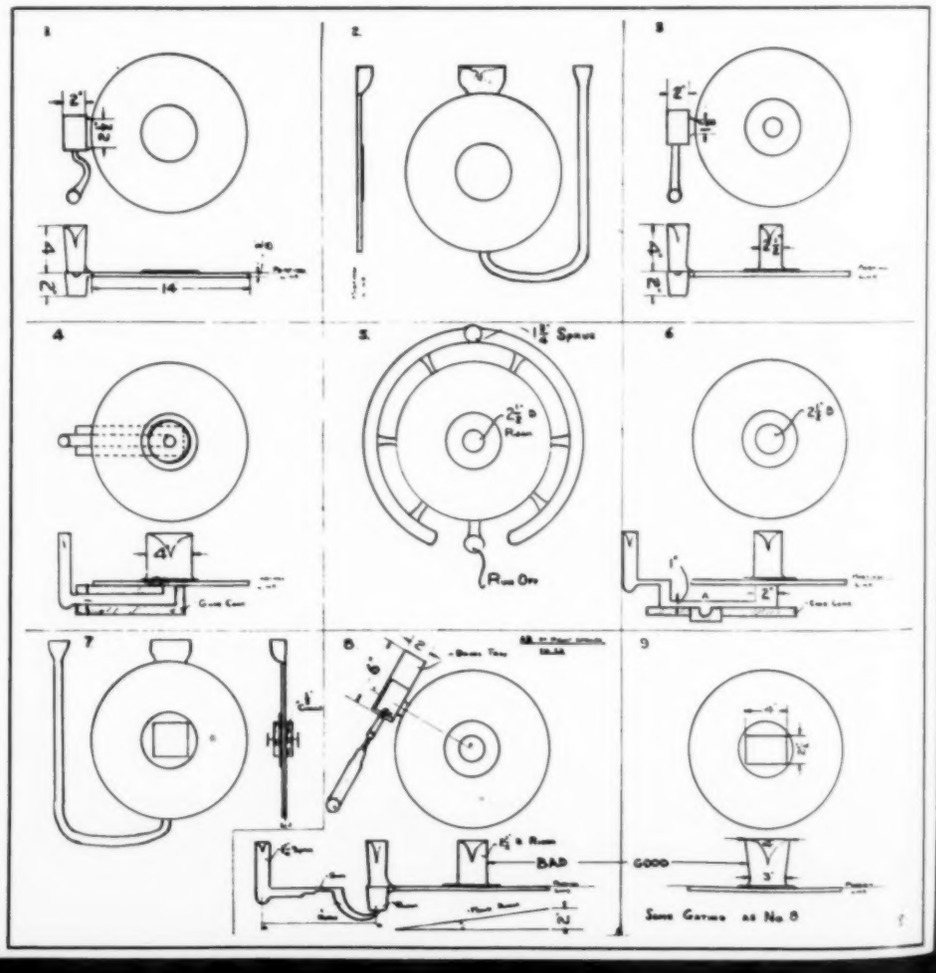
Fig. 1 indicates the successful method of pouring such a stick of bronze so that it will, upon deep etching, show a uniform acid attack as indicated by Fig. 3. If this stick be made in the usual manner, either poured from the bottom or poured from the top, it will be found to show signs of preferential attack as shown in Fig. 2.

Control Temperature and Pouring Speed

Under special circumstances the direct pouring of a stick from the top may produce satisfactory results but only when exceptional precautions as to temperature and rate of pouring are observed. It is the question of progressive feeding and freezing that is the prime requisite in the production of uniform grain size castings, which means castings that will corrode uniformly.

The problem of getting highly dross forming metal into a 22-inch diameter ring some 2 inches deep by 1-inch wide in such a manner as to eliminate all dross at the point of entry of the metal to the ring is another poser. After trying a number of methods, the one as indicated in Figs. 4, 5, 6 and 7 was used. The metal was poured into a basin in the center of the ring and led to an enlarged sprue beneath from which the metal ran through seven (*Please turn to page* 77)

Fig. 9—Different steps employed in evolving a good method for producing a solid disk in a high-shrinkage, drossy alloy



ANCIENT CHINESE CASTINGS
This collection is shown through the courtesy of
Prof. T. T. READ
Columbia University, New York City
Professor Read, who is the foremost authority
on the early history of castings has prepared a short
discussion of the early Chinese iron castings, copies
of which may be obtained on application to the attendant
of this A.F.A. booth

Group of ancient Chinese castings exhibited at the recent Milwaukee convention through the courtesy of the author

Ancient Chinese Castings

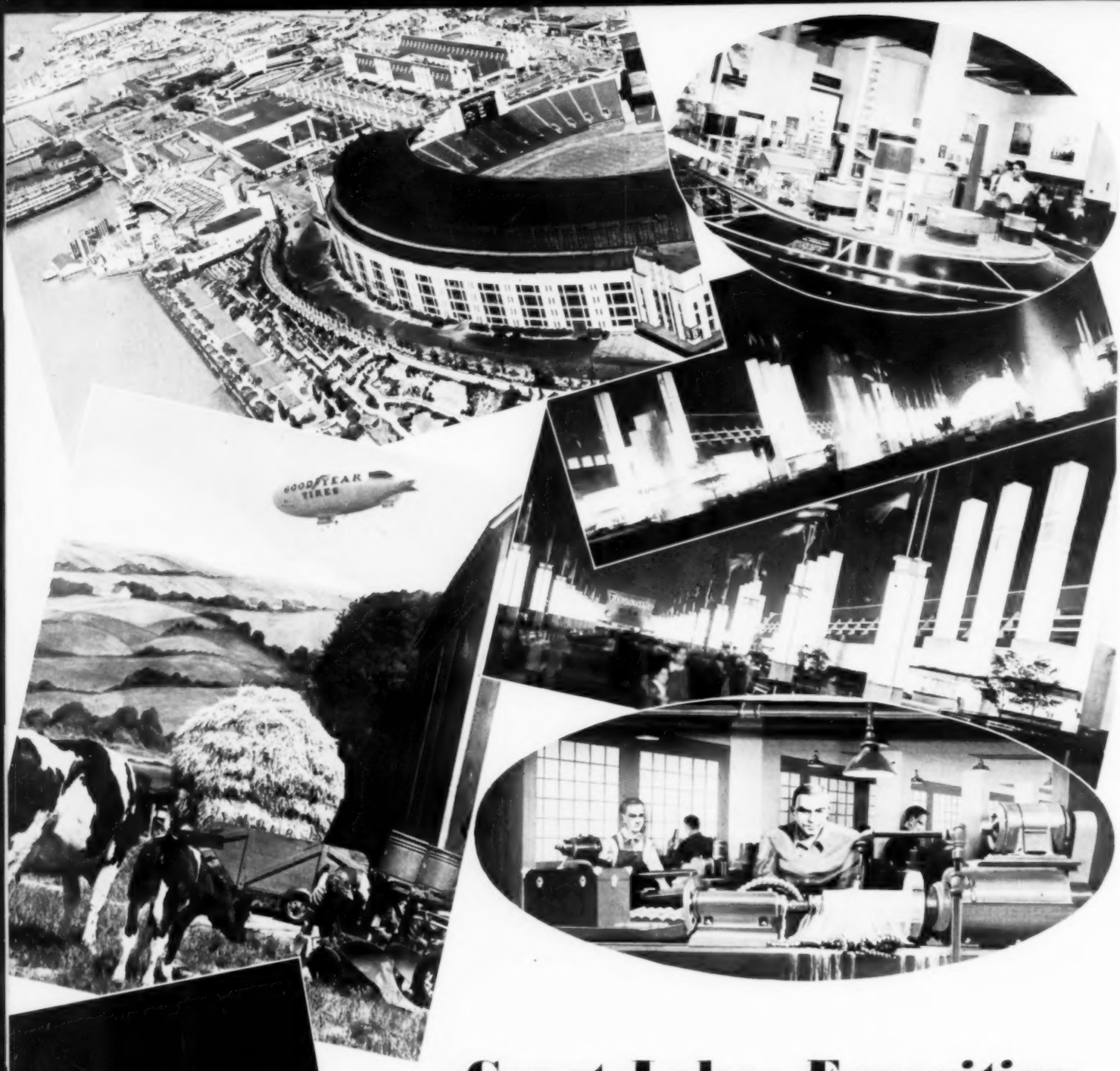
By THOMAS T. READ
Professor, Columbia University, New York

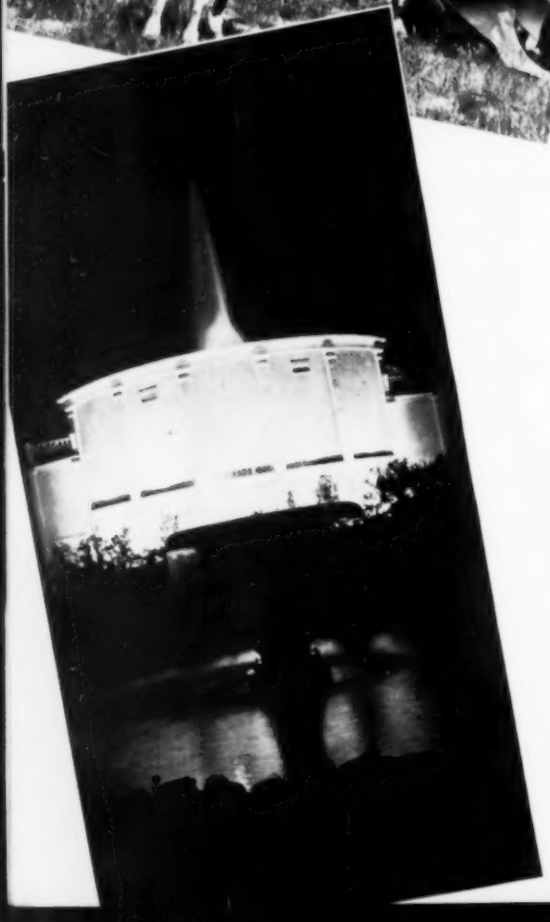
THE erroneous but wide-spread idea that the casting of iron was invented in Europe in the fourteenth century seems to be mainly traceable to Bennett Brough. He unduly influenced the views of subsequent writers who seem unaware that Brough apparently did not carry his investigation of the matter further than an uncritical acceptance of the earlier views of H. Blumner. The latter, who was a recognized scholar of classical antiquity a half-century ago, firmly believed that neither the Greeks nor the Romans were able to melt iron. Modern scholarship indicates that Blumner was mistaken, but whether he was or not need not concern us greatly, since the evidence that the Chinese were the first people to make iron castings on a commercial scale, long before the fourteenth century, is overwhelmingly conclusive.

One such bit of evidence is that the largest iron casting ever made is still standing, where it was first cast, in 953 A.D., in the yard of the Kai-Yuan monastery, Ts'ang-chou. It is a hollow image of a lion, about 20 feet high and 16 feet long; the metal walls vary from 1½ to 8 inches in thickness. As a technical achievement it cannot compare with the cast iron housing of a modern turbine, since a casual inspection reveals that it was made in one piece, like a modern concrete building, by pouring small sections of it at a time; the weak joints between the sections are quite evident. This weakness did not matter, since the lion was a religious art object, without any need for mechanical strength. What is interesting is that cast iron was cheap enough and available in large enough amounts in China in the tenth century to permit its use for this purpose. There can be no question as to the date of this casting since, like a modern bridge or public building, the date was placed on it when it was made.

Iron pagodas, ranging from only a few feet to as much as 100 feet in height, and dating from the tenth to the fourteenth century, are not uncommon in China, and are further evidence of the freedom with which cast iron was used for structural purposes at that time.

In the course of a recent visit to China search was made for smaller and earlier iron castings which bore an inscription showing the precise date at which they were made, and a number were discovered; some bearing dates as early as 500 A.D. As might have been expected, these were mostly of a religious character since any ordinary object would be likely to be broken up and remelted when it became old and obsolete. Cast iron coins, for example, have been in use in China since very early times, but, except for a semifused mass of what appear to be ninth century coins, near the lion referred to above, and presumably a relic of a fire which destroyed the monastery toward the end of the tenth century, very few specimens earlier than the thirteenth century now seem to be still in existence, though they were produced in such profusion that they are said to have been moved about in carts. (*Please turn to page* 74)





Great Lakes Exposition Plans A. F. A. Day

THE Great Lakes Exposition, which opened in Cleveland on the shore of Lake Erie on May 29, has set aside Aug. 12 as American Foundrymen's Association Day. The national association and the Northeastern Ohio Chapter are co-operating in planning the program for that day, and it is expected that other foundry organizations in the region will participate. L. P. Robinson, Werner G. Smith Co., Cleveland, is chairman of the committee on arrangements.

Many features have been added to the Exposition of 1937. The central theme is "The Making of a Nation," and includes a comprehensive collection of murals, dioramas, working models, motion pictures and other exhibits to portray the roles played by agriculture, science, education and industry in the building of America. "Aquacade" a musical marine show with a cast of 500 is one feature entertainment attraction.

Sweep Aluminum Pattern For Iron Base

By J. H. EASTHAM

FOR the comfort and convenience of tired and thirsty patrons the proprietor of the pub had installed twenty tables on the floor. These tables were all alike, 30 inches diameter, white enamel tops supported on a central leg terminating in a four leaf clover base of twisted wire. Ornamental of course, but decidedly rickety. More appropriate for an ice cream parlor patronized by the ladies and children than for the heavy fisted, sometimes rowdy clientele usually present.

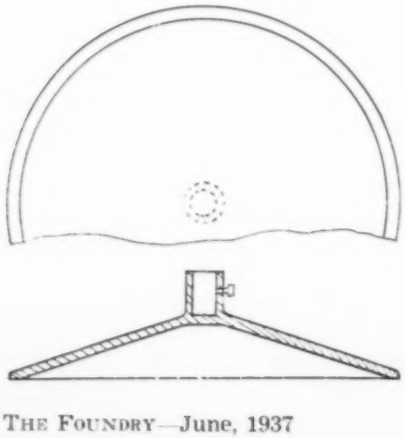
Defective design readily was apparent at the close of day when a crowd of 100 burly ship platers, boiler makers, machinists, molders and blacksmiths foregathered to sluice the pipes and discuss weighty problems of the trade. Wobbly blueprints were traced on the table tops in slopped beer, by the approved forefinger method. Tables were upset in the heat of the argument. The number of broken glasses ran the overhead up to an appalling figure and almost gave the proprietor apoplexy each time he received a bill for replacement.

After a particularly resounding crash one evening the amateur blueprint maker suggested half jokingly that the gang should supply cast iron bases for the tables. The proprietor was willing.

"How much apiece?" says he. "How soon? Six dollars already I have spent for glasses this week. I tell you what I will do. A round of drinks and cigars for every man at the table! You will do so? Ho-kay, go to it."

The design shown in Fig. 1, a circular base 18 inches diameter, 3 inches high with a central hub 2 inches high proved acceptable. The price per unit covered the cost of a pattern which would remain the property of the foundry.

In the foundry the following morning a small machined plate with a spindle socket bolted to the under side was set up on three stools. A 1-inch spindle kept for emergency core and similar purposes was stepped in the socket and a short arm was attached to the spindle by a set screw. Two machine faced cast iron flask parts, 22 inches square, 4 inches deep were placed on the plate and a sweep (*Please turn to page* 77)



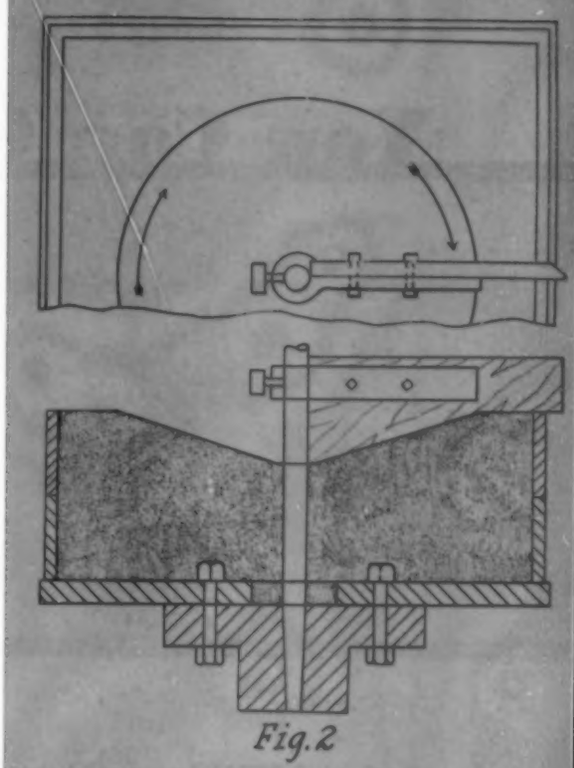
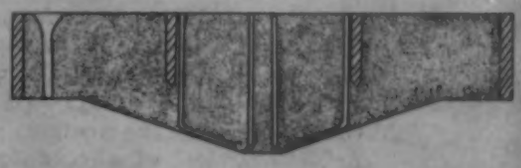


Fig. 2



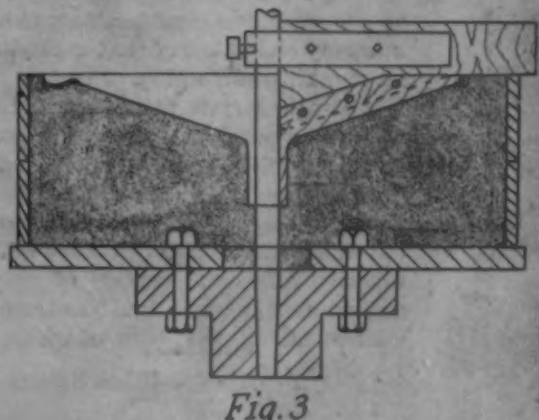
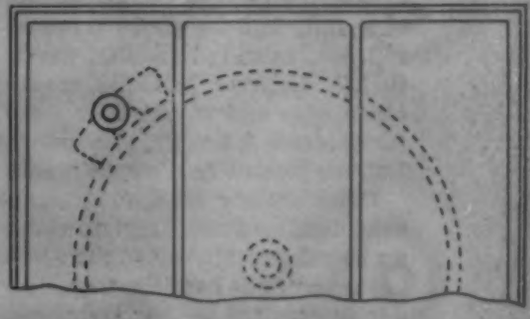


Fig. 3



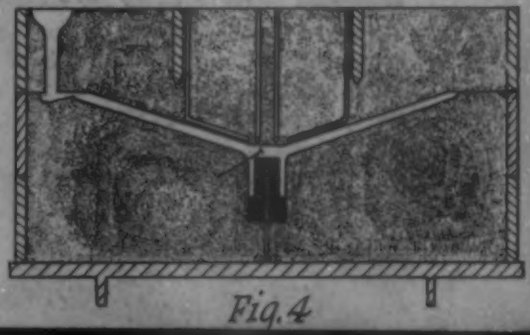


Fig. 4

Fig. 1 (Left)—Plan and section of base. Fig. 2—Drag formed with small spindle and sweep. Fig. 3—Extension on sweep removed necessary thickness of sand. Fig. 4—Plan and section of completed mold

You Can Change the Weather

BY R. CAMPBELL WELLMAN

MARK TWAIN once said that the weather cannot be changed. Therefore, he said, there is no use discussing it. While wishing neither to contradict nor belittle the philosophy of that esteemed writer, modern developments have shown that airconditioning can change the weather.

That the subject of airconditioning has a definite bearing on the foundry industry may readily be seen by observing the considerable number of castings going into only one phase of that expanding industry, namely residential conditioning.

It is appropriate to discuss and define a few of the underlying principles involved in conditioning, handling and control of air, before attempting to describe mechanical means for performing these functions. There have been many meanings written into the term, but the accepted definition of airconditioning is the simultaneous, automatic control of temperature, humidity, motion and purity of air. The term connotes two kinds, winter and summer, both of which are important.

Air Condition Affects Health

Conditioning involves moving, cleaning, moistening, drying, heating and cooling air. Water vapor is distilled constantly into the air from oceans, rivers, lakes, moist soil, etc., causing humidity, which is highly important to life. Lack of humidity causes colds, catarrh and other nose and throat diseases. Too much accounts for oppressive, muggy, uncomfortable days in summer. But the human race cannot live without it.

Unfortunately modern living has tended to create conditions resulting in an excessive amount of heat and an insufficient amount of moisture. To be comfortable, heated air must have the proper percentage of moisture, due to constant regular body temperature, irrespective of tropics or poles. Dry air steals moisture and warm air takes more than cold. The temperature of an average room, 72 degrees Fahr., is claimed to be too high. Research has shown that the winter comfort zone for the human body is 66 degrees Fahr. effective temperature, which is 70 degrees at 50 per cent relative humidity. The air should be in slow circulation. It is claimed that 25 per cent of the cost of heating a house is expended in raising the temperature from 62 degrees to the unhygienic 72 degrees Fahr. Individuals breathe 25,000 times each 24 hours, absorbing 400 to 500 cubic centimeters of air with each breath.

Citing these seemingly unrelated details performs a twofold purpose. It points out, first, a few of the multitudinous problems which such men as Carrier, Cramer, Fleisher, Hogan, Still, McCrury and others confronted in the pioneering and development of the airconditioning industry. Secondly, it presents a sketchy background for a more searching analysis of the castings going into the conditioning units and the important part they are playing in the further progress of that field.

Build Air Conditioning Unit

Confusion may be avoided most effectively by a discussion of one separate phase of the broad subject, namely, winter airconditioning for residential use. Generally speaking, a unit heater is a self-contained machine for delivering warmed or heated air to an inclosure. Usually all such units include a radiator or other heat source, one or more fans, and a motor or other means for driving the fans. These parts are placed in a common casing. Recirculating dampers, by-pass dampers, louvers, screens, filters, humidifiers, controls and other similar accessories may or may not be included, depending upon the service offered.

The Forest City Foundries Co., Cleveland, is contributing aggressively to the progress of this new and coming industry. The company's production centers around a gray iron gas-fired warm air furnace of its own design and construction, equipped for winter conditioning of air and summer blowing. This does not include refrigeration, although the unit may be equipped additionally for such demand.

Gray iron castings forming essential parts of the furnace include the front frame and door, center radiator section, side section, back manifold, two manifold extensions, a water pan, flue cover, upper cover plate, upper center strip, cleanout cover, lower center section cover, rear center strip, burner tube shutter, burner

and burner tube. Fig. 4 shows a grouping of these parts and illustrates the numerous castings incorporated into the completed unit. A number of tests and continued satisfaction indicate a substantial use of gray iron for these castings in the future.

Iron for the smaller, lighter type squeezer castings, doors, water pans and back manifolds has a silicon content of approximately 2.70 per cent; carbon, 3.50 per cent; sulphur, 0.07 per cent; phosphorus, 0.50 per cent; and manganese 0.60 to 0.70 per cent. This is a fairly soft iron poured in a continuous heat of from 4 to 5 hours from a 72-inch shell cupola with a 52-inch lining, made by the Whiting Corp., Harvey, Ill. Melting capacity of this cupola ranges from 50 to 60 tons per 8-hour day. Iron for the medium and heavier work, such as the radiator sections, cover plates, etc., has a silicon content from 2.25 to 2.35 per cent; phosphorus approximately 0.20 per cent; manganese 0.70 per cent to 0.75 per cent; and carbon from 3.00 to 3.25 per cent. This is a high strength iron poured from a 60-inch shell cupola with a 36-inch lining, located in an adjacent bay of the foundry. This cupola also is made by the Whiting Corp. and has a capacity of 25 tons per 8-hour day. Both irons are poured hot at a temperature of from 2700 to 2800 degrees Fahr.

Ladles Filled at Tipping Spout

The iron is tapped into ladles brought to the cupolas on each side of the two-way spout, as shown in Fig. 1, by an overhead traveling gangway track system made by the Chisholm Moore Hoist Corp., Tonawanda, N. Y., and the Richards-Wilcox Mfg. Co., Aurora, Ill. Drag molds for the furnace fronts and side drums, representative of the medium and heavier castings, shown in Fig. 5, are made on hand ram power rollover machines. Molding machines for this work were made by the International Molding Machine Co., Chicago.

Sand for molds has a moisture content of about 6 per cent, a green shear of 1.3 pounds and permeability of 28. Placed in convenient piles adjacent to the molding floor, it is handled manually. The company uses a fine sand for its lighter work and a coarser sand for heavy production. About 200 tons per month is used to 65 tons of melt per day. Pouring is done a few feet from the machines and completed molds are arranged in rows and handled generally with the aid of an overhead traveling crane made by the Cleveland Crane & Engineering Co., Wicklife, O., to facilitate easy pouring with the hand ladles. As a general rule castings are shaken out by hand.

All lighter work is molded on jolt squeezer machines made by the Osborn Mfg. Co., Cleveland. A conventional waterproof parting is used and aluminum patterns are adopted on practically all production jobs. Special steel flasks are employed on the furnace front and side drum castings. These were supplied by the Sterling Wheelbarrow Co., Milwaukee. All cores for this gas unit are made from a sharp sand, a small amount of core oil, and dried in the oven. The minimum amount of core oil weakens the sand, facilitates knocking out the castings and prevents hot cracks. All cores are well vented. Gates are placed in the drag with the runners in the cope. To bring about an even distribution of the metal, pouring is done from opposite sides of the mold and branch gates are placed at intervals leading from the runners to the sprue in the cope. Branch gates are a permanent part of the pattern equipment.

Assembled weight of the furnace is 550 pounds. Fig. 3 shows a sectional view of the unit. Heat is generated in the central combustion chamber which houses all the gas burners. Radiating sections are connected with this chamber by double flues at the top. Hot gases from the burners rise, spread through the connecting flues at the top of the combustion chamber into the radiating sections and then drop as the heat is extracted. At these lower portions of the radiating sections where the gases inside have spent their heat, are the points at which the fresh circulating air first comes into contact with the outside of these radiating sections. As the fresh air moves upward, being warmed, it is exposed to the extreme heat at the top of the radiators before passing into the distributing ducts.

The scientific principle of extracting the maximum amount of heat from the burned gas and transferring this heat through the metal walls of the radiator sections to be absorbed by the air which circulates through the rooms, is based not only upon this thermo-syphon, counter-flow system, but also upon the radiating section walls. These consist of a series of long, deep corrugations at opposite angles which increases the surface of the walls and maximizes their ability to absorb heat from the gases on the inside and radiate that heat to the fresh (*Please turn to page* 78)

Fig. 1 (Right)—Iron is tapped into ladles suspended from a monorail. Fig. 2—A small section of the foundry floor

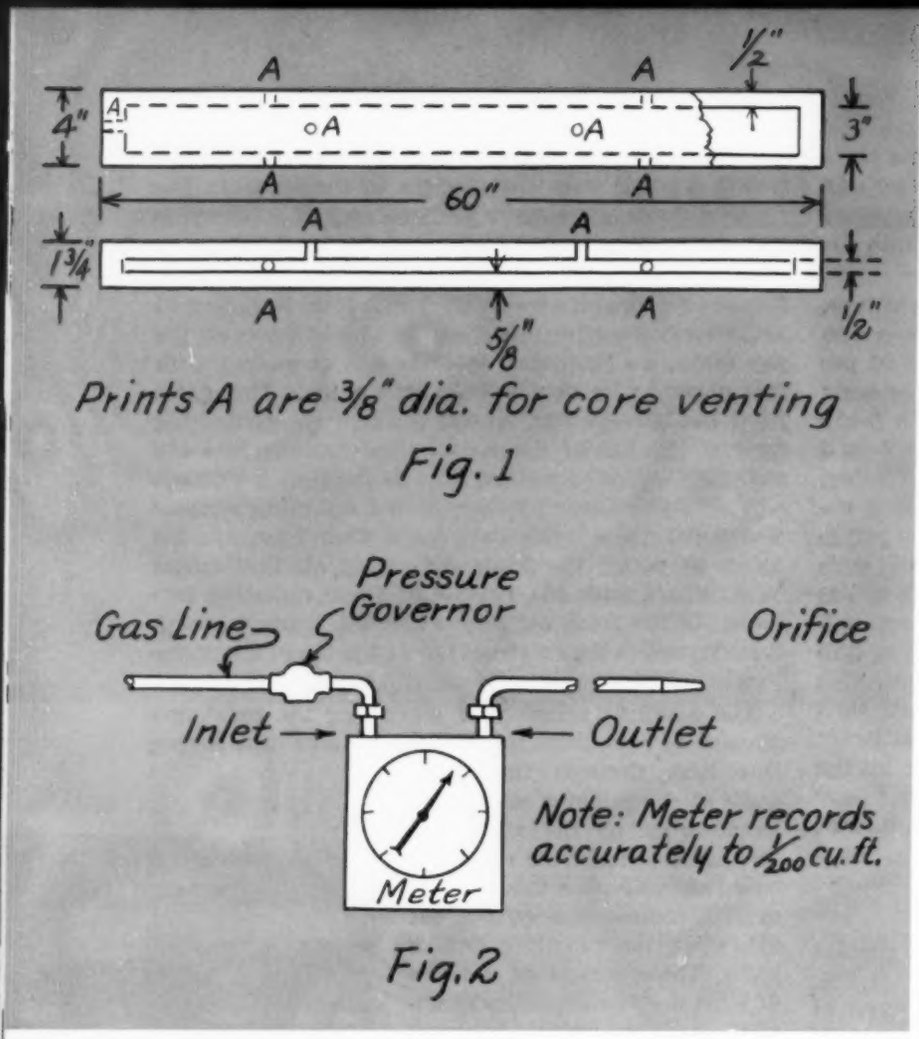


Fig. 1—The long thin core is almost surrounded by metal. Fig. 2—Apparatus employed in making the test

Shows Lighted Vents Fallacy

By A. J. CASSISTA

VENTS are lighted to help the gas to escape. A suction is created at the outlet." This statement was made by a foreman while I was visiting a foundry. At that time I still was attending school and I accepted this statement from an experienced man without question. Apparently this opinion is common and wide spread among foundrymen. So far as my knowledge extends the point never has been put to a definite test.

Later after I became somewhat familiar with fundamental laws governing gases, and more familiar with foundry work, I began to question whether the flow of gas from an orifice is increased when it is lighted. I could not find any authoritative information on the subject. Continued observation and study inclined me to the opinion that if there was any difference in the rate of gas flow it would be small and in addition the increase would be from the unlighted jet.

This opinion was based on the unquestionable fact that a lighted jet heats the air in the immediate vicinity. Naturally this results in an increase in atmospheric pressure around the jet. This increase in turn sets up additional resistance the flow of gas would have to overcome. The presence of pressure seems more logical than suction at the jet.

Recently I had the opportunity of testing this opinion on a casting that had given a great deal of trouble on account of the core blowing. The long, thin core in this casting, as shown in Fig. 1, was surrounded completely by metal with the exception of a few small core prints. When the pattern was given to me I was warned that the most important item in the routine of production was to light the vent outlets before commencing to pour the iron. If this was not done the core surely would blow and the casting would be a waster. To comply with this instruction it was necessary to place oily waste near each vent outlet. The mold was poured from four hand ladles. The flask was small and the pourers had to stand close. Seven high flames from the bunches of oily waste interfered with proper and orderly pouring.

Calm analysis of the condition seemed to indicate that the failure to secure a good casting was due more to improper setting and securing of the core, than any failure of not lighting the vents in time. The core was thin and fragile and in my opinion, either was broken while being anchored in place, or, while the iron was filling the mold. Any break or breaks in the core allowed the metal to enter the vents with the resulting scrap casting.

That this diagnosis was correct was proved by the successful production of 20 castings on none of which, except the first, was the gas lighted in advance. Particular care was taken in setting and securing the core in the mold and the metal was poured in a manner to cause even and uniform filling of the mold.

This experience fully convinced me that in foundry practice the rate of escaping gas is not a factor whether it is lighted in advance or unlighted. The experience also renewed my interest in determining whether gas flowed more rapidly from a lighted or unlighted jet. Data readily could be obtained by a simple experiment. I proposed the question to an engineer who had charge of a laboratory. He claimed it was useless to run any test. He was emphatically of the opinion that gas flowed more rapidly from a lighted jet. He presented theories on heat applicable to lighted jets and the currents set up about the orifice which would facilitate the escape of gas. He professed (*Please turn to page* 80)

Prevention of Silicosis Through Engineering Control

THE committee on the prevention of silicosis through engineering control has prepared a report presenting, in a general way, the most effective engineering measures which have been found of value for the control of silicosis to the end that these can be put into general practice wherever a dust problem exists. This summary indicates the general character of the information presented in the complete report and brings out in a concise manner some of its more important features.

In this report the basic engineering fundamentals involved in dust control are discussed in sufficient detail to permit their utilization in the solution of specific problems in individual plants. It is to be emphasized that the methods recommended by the engineering committee have been employed successfully under actual operating conditions in the plant.

One of the first essentials in the control of the dust problem is the recognition by the plant management that a problem exists and then a determination on their part to institute measures for its solution. With this attitude on the part of management, industry can make great strides in the control of this problem by the immediate institution of preventive measures based on present engineering knowledge.

The economic phases of the situation are taken definitely into consideration in recommending procedures for control of the dust hazard. The recommended procedures are intended for use not only by large industrial organizations, but also by smaller companies, which often are unable to participate in the conduct of studies and research but which have just as real a problem in the prevention of silicosis.

Substitution of materials is applicable to the elimination of the silica dust hazard only to a very limited extent. For the most part, the solution of the problem depends upon reduction of the concentration of the dust to safe limits.

The following several phases of engineering control each were considered by a subcommittee which developed a report on its respective subject, with the final collaboration of all members of the engineering committee: Plant design and renovation; application of good housekeeping and maintenance to dust control; methods of ventilation and dust collection; wet methods; personal respiratory protective devices—their uses and limitations; determination of concentration and character of industrial dusts; management's and employe's responsibility in engineering control; dust concentrations in occupational exposures.

It is the intent of the committee that the discussion of these phases of the problem will result in a wider dissemination of the information on means of dust control, in the increased application of known engineering methods, and in the stimulation of further investigation of improved methods for prevention of inhalation of excessive quantities of dust which may be present in the air.

The first step toward prevention and control of silicosis should be taken when a new plant building program is contemplated or existing plants are remodeled or renovated. In deciding on the location of a new plant, in addition to the natural economic factors which must necessarily be of first importance, consideration should be given to the effect of the operation of a proposed plant involving dusty operations on the surrounding neighborhood. In the establishment of the new plant, it is of vital importance that adequate attention be given to the proper design of plant facilities and to the safeguarding of all dust producing op-

Conference Report

INTERESTING information on four phases of the silicosis problem was presented at the Second National Silicosis conference held in Washington in February at the call of Secretary of Labor Frances Perkins. Reports were presented by the four committees which follow: Committee on Prevention of Silicosis through Medical Control; Committee on the Prevention of Silicosis through Engineering Control; Committee on the Economic, Legal and Insurance Phases of the Silicosis Problem; and Committee on the Regulatory and the Administrative Phases of the Silicosis Problem.

This article and one to follow in the July issue constitute a summary of the report of the Engineering committee which has been released for publication. James R. Allan, International Harvester Co., Chicago, and E. O. Jones, American Foundrymen's Association, Chicago, were members of that committee.

erations so that employes working in the plant may be safe from silicosis hazards. It is imperative that the management exercise the utmost of good judgment in the application of control measures, yet not interfere (or at least interfere to a minimum extent) with other essential features of the enterprise.

Plant structures which house activities creating a dust hazard should include in their design features which will facilitate dust control. For instance, projections, ledges, and resting places for dust and dirt should be eliminated or minimized. Attention should be given to such architectural details as window sills, window sash, lintels, column and post caps to prevent the settling of air-borne material that might later be released into the atmosphere by shock or jar to the building structure. Such shocks and jars are imparted by traveling cranes, vibrating machinery, and equipment having large reciprocal parts.

Building interiors should be so designd that they may be cleaned easily by such methods as washing or hosing down, vacuum cleaning, or brushing. If vacuum cleaning or washing methods are to be employed in cleaning the structure, the piping systems should be installed and connections provided at proper intervals.

Presents Engineering Problem

The committee wishes to stress the point that our present day engineering and structural materials for factories do not permit elimination of innumerable ledges and projections without prohibitive building and roofing costs. Here is a problem for the structural engineer—the elimination of ledges and projections caused by flanges and legs of steel sections, and general design for the facilitation of good housekeeping.

A close examination of existing structures may disclose unnecessary superstructures installed for some former type of occupancy that can be removed, thereby eliminating resting places for dust. It sometimes is feasible to enclose trusses or beams that have wide flanges. Occasionally shelves and projections may be eliminated by the proper installation of shields set at an angle greater than the angle of repose of the dust.

Where there may be a considerable spillage of dusty material onto the floor, the operations are sometimes located over gratings, beneath which is equipment for handling the material that falls into them.

Among other provisions suggested is that of proper location of passage ways so the least number of persons possible will be compelled to travel in the more dusty plant zones.

Natural ventilation usually should be considered only an adjunct in removing or reducing dust in the air. Even though it is possible to have high roofs in one-story structures which will give optimum benefit from natural ventilation, such ventilation cannot be relied upon at all times and never should be relied upon when a mechanically operated system is necessary to provide adequate protection.

Where mechanical ventilating systems are provided, care should be taken to prevent strong drafts from open windows and doors destroying the effectiveness of the system. Guards or shields should be placed in the vicinity of hooded or partially enclosed processes to prevent such a condition.

Dusty materials should be stored in dust-tight enclosures. These structures should be provided with breather or vent stacks to permit the air displaced during loading to be carried outside the building. If the air is extremely dusty, an exhaust fan should be connected to the vent stack.

Where the storage building is being serviced by overhead cranes, particularly when the dust is of high silica content as in a sand storage building, the cab of the crane operator should be provided with a supply of filtered air.

Basements may be utilized for storage purposes and never should be utilized for manufacturing activity where dusty operations are involved.

Mechanized material handling equipment creates much dust but this source of dust dissemination can be controlled by provision of adequate housing and application of exhaust systems. Many times materials can be kept in a moist condition when being handled but when this is done considerationin should be given to the possibility of the material drying out and being dispersed into the atmosphere as a dust.

Processes that produce a great amount of dust are best isolated from the rest of the plant. Wherever possible dust-producing units should be grouped together as this permits a more compact exhaust system installation, resulting in its more efficient operation and lower maintenance.

Operations producing excessive amounts of dust should be exhausted adequately at the point of origin. In many cases several small systems are preferable to a larger system. Any mechanical ventilation system should be designed to meet at least the minimum requirements of local state laws or industrial codes, or lacking such requirements, should be installed according to the best accepted practice.

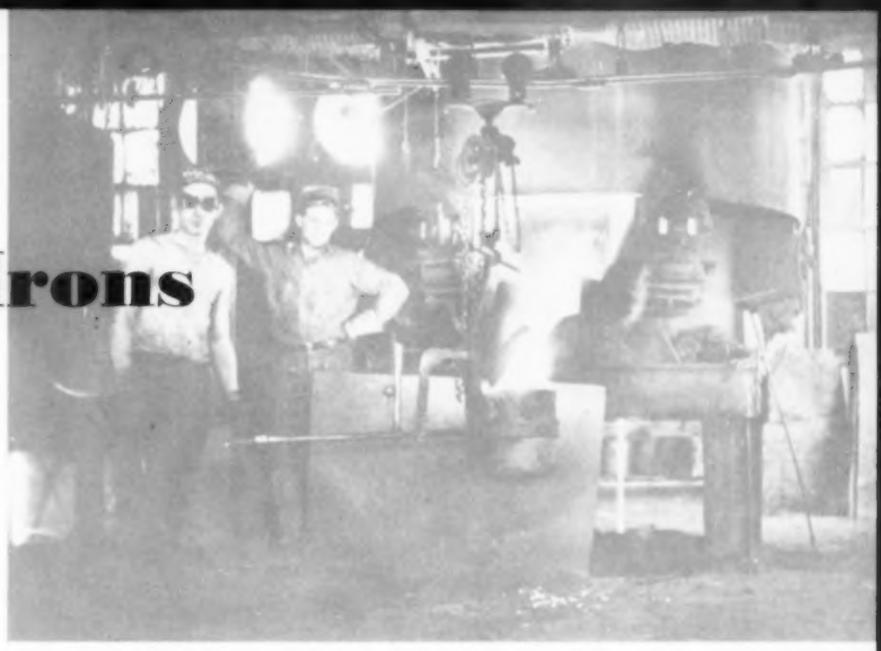
Location of Dust Arresters Important

Provision of dust arresters will prevent hazardous dusts from being circulated into other parts of the plant or into the neighborhood. The location of dust arresters is very important, particularly if dry types of arresters are used. Provision should be made for removal of the collected dust without its escape into the area where the arrester is located. Recirculation of air from an exhaust system handling silica dust is not recommended.

Frequently new equipment can be designed so that dust control can be more easily applied. The vendor of equipment should be encouraged to provide exhaust hoods, if necessary, as a regular part of the equipment. The machine thus may be attached to an existing exhaust system.

The literature of the United States bureau of mines treats in much detail important phases of dust control in underground operations. It is pointed out that not only should a complete system of mechanical ventilation be installed for supplying clean fresh air to the workings, but in addition it is of especial importance that attention be given in supplying adequate water facilities for use where required for drills, for wetting or washing down, and for other measures involving the promotion of health and safety.

Order and cleanliness are important factors in dust control. The best equipment (*Please turn to page* 83)



Special Pig Irons In the Foundry

By EDWIN A. JONES
Globe Iron Co.
Jackson, O.

IT IS quite difficult, if at all possible, to give a definition of special pig iron. As pig irons are produced to more and more rigid specifications covering size of pig, structure, etc., as well as amounts of usual elements, all foundry irons almost could be considered special. However, this discussion will consider as special any iron that is outside the usual range of foundry irons; namely 0.75 per cent to 3.50 per cent silicon and 0.15 to 1.50 per cent manganese.

Carbon, silicon and manganese are the essential and most important constituents of gray cast iron. Hence, pig irons carrying unusual amounts of these elements occupy a most important position among special irons. In addition to these, pig irons are being produced regularly containing varying amounts of such alloys as chromium, nickel, vanadium, etc.

Special pig irons have been valuable tools in the hands of progressive foundrymen in lowering costs and improving quality. A knowledge of the essential characteristics and limitations of these pig irons will enable the average foundryman to derive the maximum benefit from their use.

One of the extensive uses of special pig irons is in connection with the introduction of high percentages of steel in cupola charges. For example, a high strength iron is required of about 2.30 per cent silicon content and it appears advisable to use 60 per cent steel in the charge. The return scrap will average 20 per cent and the remaining 20 per cent will consist of pig iron. With a mix of that type there generally will be a loss of silicon in the melting operation, which may be assumed to be 0.20 per cent, thus requiring a silicon content of 2.50 per cent in the charge. With the silicon content of the return scrap 2.30 per cent and that of steel nil, the pig iron must contain 10.20 per cent silicon.

A relatively high manganese content usually is desirable for these high strength irons. In this case if a manganese content of 0.85 per cent is desired in the castings, about 1.05 per cent will be needed in the charge. With 0.85 per cent manganese in the return scrap and 0.50 per cent in the steel, the pig iron must contain 2.90 per cent of that element. If the metal is to be poured in fairly heavy section castings, then a relatively low phosphorus content is desirable, and the pig should contain under 0.20 per cent of that element.

The purchase specifications for the pig would then be: Silicon 10.00 to 10.40 per cent; manganese 2.50 to 3.00 per cent, and phosphorus under 0.20 per cent. Such a specification does not cover all the requirements of a suitable pig iron, but before discussing the matter further, consider another use of special pig irons which is becoming increasingly popular, namely in mixes carrying a high percentage of foreign cast iron scrap. Castings of ¼-inch section and of excellent physical properties and machinability are being made regularly from mixes containing as little as 12 per cent pig iron in the mix, the remainder being purchased scrap and returns. However, in many cases the foundryman is more conservative and the more usual mix of the type will be: Standard No. 2 foundry pig, 10 to 12 per cent; special high silicon pig, 8 to 10 per cent; and scrap, returns and purchased, 80 per cent.

A survey of mixes in regular production today would show steel contents from 0 to 80 per cent and scrap cast iron (returns and purchased) from 30 per cent to 90 per cent. By an intelligent combination of the four basic materials: Steel scrap, cast iron scrap, standard foundry pig, and special pig irons, a foundryman can develop a mix that will produce satisfactory iron for his particular purpose.

There are few foundrymen who have not felt, at some time or other, that satisfactory castings could be made from an all scrap cupola mix, especially if the elements lost in the melting process were replaced by suitable additions of concentrated ferroalloys. Perhaps preliminary experiments along this line were sufficiently favorable to warrant establishing such mixes for regular production. However, an increase in defective castings often results unless exacting technical control is available. The immediate cause of the difficulty is due to the fact that an appreciable quantity, usually in excess of 20 per cent of the metal melted, is charged back into the cupolas as return scrap and hence any inherent defect in the metal (*Please turn to page* 86)

QUESTIONS and ANSWERS

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions from subscribers addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the advisory staff.

Wants to Make Equipment for Chilled Rolls

Can you refer us to any recent articles in THE FOUNDRY or other publications on the subject of proper chill equipment for chilled iron rolls?

An article on various phases of chilled roll making, including construction, application and treatment of chills, as practiced in a prominent roll making establishment appeared in the July 15, 1935 issue of THE FOUNDRY. The entire subject of chilled roll making as applied to small and medium weight rolls is covered comprehensively in *The Manufacture of Chilled Iron Rolls* which may be ordered through THE FOUNDRY, Cleveland.

Balance Wheels Develop Cracked Spokes

We are casting some large balance wheels from 3 to 6 feet in diameter, hub 17 inches diameter and 8 inches high. We have lost a few of these wheels due to cracked spokes. Can you advise us how to overcome this difficulty?

Under normal conditions the only procedure necessary is to dig out the center core as soon as possible after the metal has solidified. This equalizes the cooling speed between the rim and the hub. In some instances it may be necessary to further accelerate the cooling of the hub by pouring water on the inside and around the outside of the bared hub. This is the usual method, but occasionally instances arise where the procedure has to be reversed and the rim has to be stripped first. Many factors have to be considered, including the general design of the wheel, thickness of metal section, shape of arms, method of gating, temperature of the metal and whether the mold is dry or green sand. In some instances it is necessary to split the wheel at diametrically opposite points to prevent rupture during the cooling and contraction period.

Wheel Casting Was Cracked in Shaking Out Process

We are forwarding for your inspection a small wheel, cracked in a peculiar manner for which we are at a loss to find an explanation. Analysis of the iron shows: Total carbon, 3.26 per cent; silicon, 2.69 per cent; sulphur, 0.068 per cent; phosphorus, 0.30 per cent; manganese, 0.76 per cent; chromium, 0.20 per cent, and nickel, 0.15 per cent.

You do not state how many castings were in the mold or the manner in which they were gated. However, from the ground area at one point where apparently the gate was attached, we are inclined to the opinion that the gate was too heavy and that it was knocked off while the casting was still too hot. This hypothesis is borne out by the fact that the casting is ⅛-inch greater in diameter one way than it is on a line drawn at right angles.

This would seem to indicate that force was applied at one side, for example a heavy hammer blow applied in removing the gate while the casting was in a state that it readily might be distorted. The characteristic appearance of the fracture indicates that the casting was cracked while hot. How this defect remained concealed only to appear after the casting was delivered into the customer's hands is one of those things that occasionally happens when the inspector nods. If, as you claim, this particular, individual casting was perfect leaving your plant, we regret that we can think of no plausible explanation for the phenomenon.

Matt Surface on Background Obtained in Many Ways

In making patterns for bronze tablets, we would like to ask how the rough background on them is obtained.

The matt surface on the background of signs and grave markers, etc. is obtained in several ways. The most common is that of gluing a piece of cloth of the right texture to the wooden master pattern to produce the rough appearance after it has been shellacked and the metal pattern cast from it. For this purpose many types of woven fabrics are used depending upon the coarsenesss of the matting desired. Oftentimes burlap is used to give a very coarse effect and sometimes a finer material, such as is used for curtains is shellacked on the wooden pattern before the lettering is attached.

This matted effect on wooden patterns sometimes can be produced by punching the wooden surface carefully with a tool previously made to form the desired impressions on the background of the master pattern. For this purpose a belt punch has been used. When carefully done this produces a rough matting on the wooden pattern that when reproduced on the metal pattern gives a finish which cannot be achieved in any other manner. Sometimes a piece of canvas is glued on the wooden master pattern and then shellacked, after which the metal pattern is cast and carefully cleaned up.

That method is believed to be the most commonly used by pattern makers. Many have worked out special methods whereby they produce effects that are appealing and in some instances very artistic. Like everything else, careful workmanship and patience give the best appearance and the greatest satisfaction. The most important factor is to clean up the metal pattern carefully so that imperfections on the surface have been corrected to insure the pattern leaving the sand in a satisfactory condition when used to produce castings.

Several Methods Available For Disposal of Cupola Slag

Has the subject of slag disposal in the gray iron foundry ever been discussed in THE FOUNDRY?

The subject of slag disposal has been included in several articles dealing with general foundry practice in various plants throughout the country, which have been published in THE FOUNDRY. Briefly it may be said that slag is removed from the cupola vicinity according to one of two methods, either mechanically or laboriously by pick, shovel and wheelbarrow. In the latter method, practiced by practically all small foundries and by some of the larger foundries, the slag falls from the slag hole into a hollow place back of the cupola. This hollow is large enough to collect all the slag developed in the day's heat. It is allowed to cool over night and on the following day is broken with a pick, loaded into a wheelbarrow and transported to a suitable dumping place.

Manifestly this method is not entirely satisfactory, for a large cupola running on long heats where the amount of slag assumes considerable proportion. In some instances of this kind small buggies are wheeled in succession under the stream of slag. As each buggy is filled it is wheeled away and replaced by an empty one. In a second method a perforated steel box is lowered into a pit back of the cupola. The pit is filled with water. The slag breaks up to some extent as it enters the water. When the box is filled it is removed by a crane and the contents either dumped into a railroad car, or loaded on a truck and taken to the dump.

In a third method the stream of slag as it falls from the slag hole meets a stream of water which disintegrates the material. The mixed slag and water flows away in a gutter, either to a suitable dump, or into a steel box which later is taken away and dumped. In a few plants conical cast iron pots are suspended from a turn-table which brings them in turn under the stream of flowing slag. The loaded pots are removed in turn by a small special truck which conveys them to the dump, where they are inverted and the lump of slag falls out.

Pouring Temperature Will Vary With Class of Work

Will you please tell us the safe temperature at which to pour 88-10-2 and 88-8-4, as well as that for aluminum $\frac{3}{16}$-inch thick.

Pouring temperatures for alloy 88-10-2 and 88-8-4 vary with the class of work to be poured. Where very thin sections are desired in the castings, the metal must be poured hot enough to run them, but a temperature of from 2150 to 2250 degrees Fahr. generally is conceded to be satisfactory for either of the alloys; although sometimes the one with the higher zinc content may require a few degrees more than the other. The most important factor to be remembered is that the alloy should be melted rapidly and not heated in the furnace any hotter than is absolutely necessary to pour the work satisfactorily. To superheat the alloy in the furnace and then allow it to cool down to the proper pouring temperature is bad practice.

It is difficult to give the proper temperature in degrees for pouring aluminum castings 3/16-inch thick, since we are not advised what alloy is being poured. Obviously when the aluminum contains more or less alloying agent the temperature needs changing. In other words, high copper content would change the temperature required as compared with an aluminum alloy containing a low percentage of copper; or an alloy containing more or less zinc would be different from that containing copper. Good practice dictates that aluminum should be poured as cold as the casting will permit. Of course, the temperature has to be high enough to insure sound, clean satisfactory castings. To pour so cold as to produce cold shots or misruns is as bad as running the alloy too hot.

Where castings are being made in sufficient quantities to warrant a little experimentation, it is desirable to make careful tests to determine what temperature is best for the casting at hand, regardless of the theoretical desirable temperature.

Castings of Copper Must Be Solid

We have an order for some copper castings which have the form indicated in the enclosed sketch. We are having trouble with these castings, and you will note that one portion of the casting is machined on all four sides, and the castings must be perfectly solid. We use ingot casting copper, melted in coke fired crucibles. We use No. 00 Albany sand. The castings are about 6½-inches long, the section machined is about ¾ x 1½-inches, and the casting weighs about 3½ pounds.

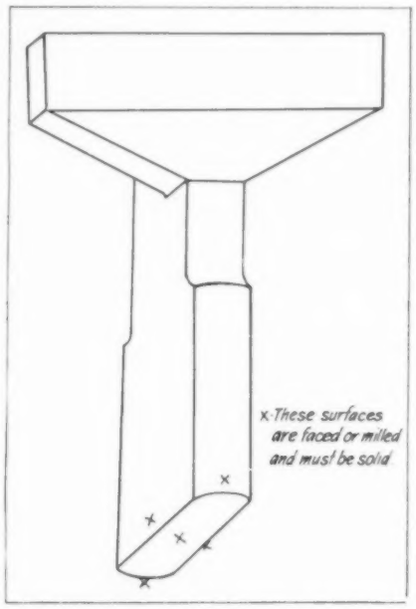
Ingot casting copper properly deoxidized, should give solid castings. Whether or not commercial copper castings are pure copper or slightly alloyed will depend largely upon the agreement between consumer and producer. In some instances, they are pure copper deoxidized with some agent which is, to all practical purposes, removed during the deoxidizing process, while in other cases, it may be deoxidized with zinc to the extent of about 2 per cent, and which, to a large degree, remains in the final product.

We believe that your difficulty primarily is in obtaining a solid section, particularly at those points where the casting is machined. That conclusion is based on the fact that you are using an extremely fine grade of sand for the casting. We believe that you will overcome much of that difficulty by employing a much coarser grade of sand than you are using at the present. For example, we would suggest a No. 1 Albany sand, or, if that is not available, open up that which is available by additions of coarse sharp sand. Size of the casting is such that there is no need for going to dry sand since it can be produced satisfactorily in green sand.

You presumably are molding it horizontally, which is the logical way. Since one end is machined all over, it is not advisable to gate into that section although with proper attention to insure a clean sprue and gate, there should be no trouble. However, there is less likelihood of trouble if the casting is gated on the opposite end. In such a small casting, there is no necessity for risers, provided the sprue and gate are sufficient in size and height to feed the casting properly.

Determination of the best pouring temperature will have to be ascertained experimentally as the best results will be obtained by employing the lowest possible temperature. Therefore, we suggest that you try pouring at 2300 degrees Fahr. and observing the results. If the mold fills completely at that temperature, try reducing the temperature until you reach the point at which the mold just fills, and then add 50 degrees Fahr. to that temperature to be on the safe side.

Numerous deoxidizers are available for copper, and names of manufacturers of those agents may be obtained from the advertising pages of THE FOUNDRY with information on their use. Copper should be melted hot and fast, and like any other nonferrous material, should not be allowed to stand in the furnace subject to the attack of furnace gases. We believe that a charcoal covering is satisfactory during melting and pouring. During pouring the metal should not be completely skimmed, but remain under the protection of the charcoal covering which is held back with a skimmer.



After machining the surfaces indicated, no holes or porosity should be evident

Crack Results From Hard Ramming

We are casting several types of heavy truck transmission cases and clutch housings weighing from 60 to 95 pounds. Many of these castings show a fine crack in the pan rail at the junction of the heavy side and thin top wall. The cupola charge contains steel 12 to 14 per cent, shop scrap 35 to 40 per cent, remainder pig iron. Analysis of the iron shows: Total carbon 3.35 to 3.45 per cent, combined carbon 0.40 per cent, manganese 0.60 per cent, silicon 2.35 to 2.45 per cent, phosphorus 0.20 per cent, sulphur 0.10 per cent, chromium 0.12 to 0.15 per cent, nickel 0.08 per cent. The cracks appear only on the cope side of the casting.

Since you do not state which side of the casting is cast up, we cannot determine whether the cracks are on the inside or the outside of the casting. If they are on the inside, that is the hollow part of the casting, they probably are caused by contraction. The sand is too hard and does not yield readily enough. If they are on the outside they are probably caused by shrinkage. The light part of the casting sets first, and later the heavy part pulls away. A third possibility may be that the gate is placed in such a manner that it prevents the casting from contracting normally. Possibility exists that all three factors may be responsible. Close examination of a defective casting, bearing the foregoing possible causes in mind, should suggest a solution and the adoption of the proper remedial measures.

Bronze Gear Blanks Made in Chills

We have been making bronze worm gear blanks in sand molds but desire to change to chill molds with the idea of obtaining better wearing properties. Can you give us any information on the details involved including the following: How are the chill molds constructed; ratio of chill thickness to rim thickness; what metal is used for the chills; what coating is used on the chills; how are vents taken off and risers used; method of gating; and pouring temperature? We have been using the 89-11 alloy but if a better one is available for the parts, please advise.

Your inquiry relative to the production of bronze worm gear blanks in metal molds encompasses a territory exceptionally large and therefore of necessity, only a few of the high spots can be touched upon. Chill molds can be made in two or three pieces. The 3-piece type consists of a top plate, a bottom plate, and a ring placed between the two; the ring usually is held in place with dowels. In the 2-piece mold, the bottom plate and ring are combined as one.

Ratio chill thickness to rim thickness will have to be determined by experiment, but according to Marius it may be calculated from the following formula:

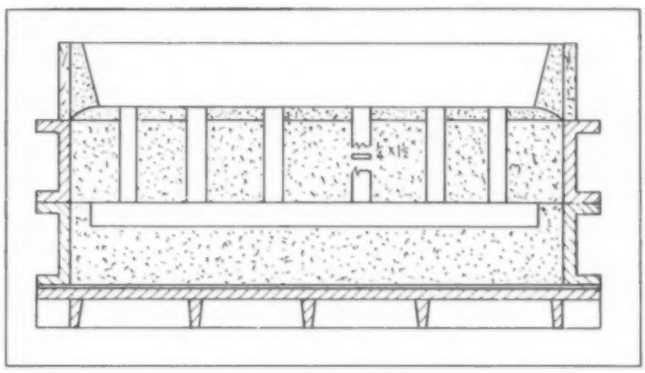
$$\frac{w\,(t-t^1)}{Pr \times Rt} \times \frac{1}{H} = T$$

w = weight of casting; t = pouring temperature of alloy; t^1 = temperature of casting at shaking out; Pr = time in minutes casting remains in mold before shaking out; Rt = maximum allowable increase in mold temperature after pouring; and H = height or length of casting.

A good grade of gray or alloy iron which is dense and has a smooth

surface will give the best results in the mold. One suggested composition contains 1.75 per cent silicon; 1.50 per cent nickel; and 0.60 per cent chromium. Chills usually are given an extremely thin coat of paraffine lubricating oil containing a small amount of lamp-black or ceylon graphite. Kerosene is not recommended due to its low flash point. Vents usually are not necessary as any gases developed generally can escape freely through the joints of the mold. A riser is employed, and usually is located in the center core forming the bore or hole in the center.

Gating of the mold will depend of course, upon the size of the casting, but where possible, the gates should be located centrally and arranged so that the cavity is fed from the bottom. Ordinarily where the bore or hole through the hub is large enough, gating is accomplished through the use of a hollow core with two or more small openings at the bottom to distribute the molten metal evenly over the bottom plate. The core of course, extends through the top plate and a pouring basin or runner cup is placed over it or adjacent to it; the basin or cup being of sufficient height to supply the necessary head of metal for feeding the casting properly.



Longitudinal section through assembled mold showing gates and runner basin

Usually the pouring temperature is from 75 to 100 degrees higher than the pouring temperature for sand molds although that is a matter of experiment, and the best procedure is to pour at the lowest possible temperature which will produce good castings. That procedure also will save wear and tear on the molds. Before starting to pour the molds, they should be heated to at least 250 degrees Fahr. to prevent cold shuts, seams, etc. After the initial heating, the mold usually will remain hot enough from the contact of the molten metal, provided not too long an interval occurs between pouring, shaking out, setting up and pouring again. However, there is another point to consider, and that is the possibility of the mold becoming too hot during use. If that occurs, considerable time will be lost in solidification of the castings, and a compromise must be effected.

Use of the 89 per cent copper, 11 per cent tin alloy in metal molds should give a much finer grained structure than in sand molds. However, many worm gear blanks are made from aluminum bronze containing 90 per cent copper and 10 per cent aluminum, or 88 per cent copper, 10 per cent aluminum and 2 per cent lead.

Several Methods to Gate Plate

We shall appreciate your opinion on the best method of gating a phosphor bronze plate 34 x 35 inches, 2 inches thick. The mold is to be made in an iron flask and dried in the oven. The casting is to be machined all over and must be clean and solid.

Method of gating is not a major factor in this instance. Metal may be introduced to the mold in any manner that is convenient. However, care must be taken to provide a runner and gate that are perfectly clean, passages in which the walls will not wash or crumble and thus incorporate sand with the stream of metal. Dirt from this source, or metal that it not melted properly constitutes a greater menace than the size, shape or position of the gates.

A firm mold probably is the most important factor in securing a perfect casting. If the mold strains after it is filled with metal, the top crust will sink. A superficial examination would suggest that the metal shrunk to an abnormal extent and therefore one or more feeding risers are required. As a matter of fact a plain, flat plate of uniform section will shrink uniformly all over and will not require any extra feeders. The present plate could be cast satisfactorily in an open sand mold if ¼-inch finish was allowed on top for machining.

In many instances of a similar character an open sand mold is preferable to a mold that is closed. If any dirt or scum forms on top of the casting, it can be seen and scraped off before the metal solidifies. In the event that you are limited in choice to one of the orthodox methods of gating this casting, we suggest a row of six ¼ x 1½-inch pop gates across the center to be fed from a long narrow basin extending across the top of the cope. Estimated weight of the cleaned casting is about 666 pounds.

The accompanying illustration shows a longitudinal section through the assembled mold. The basin is made by ramming green sand around a wood block 3 feet long, 5 inches deep, 4 inches wide at the top and 2 inches wide at the bottom. The dried sand op top of the cope forms the bottom of the basin.

Wants Information On Iron Rolls

We are seeking information on methods, materials and equipment employed in the manufacture of chilled iron rolls for sheet mills. I shall appreciate your kindness in referring me to any published material on this subject.

A book entitled *The Manufacture of Chilled Iron Rolls*, by Archibald Allison, probably will give you all the immediate information you require. This book is published in England and deals with British irons, but that is only a detail which does not affect materially the principles laid down. The book may be ordered through THE FOUNDRY. An illustrated article dealing with the manufacture of rolls in a prominent American plant was published in the July 15, 1935, issue.

A comprehensive treatise on the subject *How Steel Mill Rolls Are Made* appeared in two sections in the Aug. 1 and Aug. 15, 1921, issues of THE FOUNDRY. However, it may be pertinent to point out that the manufacture of rolls is a highly specialized branch of the foundry industry in which skill only can be obtained over a long period of special training and experience. In recent years the various roll manufacturers have developed alloy combinations, in many instances patented, which insure better performance and longer life. Almost without exception, all modern rolls, particularly those intended for hot rolling, are made from metal melted in the air furnace.

As pointed out previously, one of the most essential qualifications for roll making is long, practical experience. Without that specialized training, it is difficult to ascertain the causes of some of the troubles that arise from time to time, and which might be attributed to downright contrariness of everything in general. Loss of a roll is rather expensive, and it cannot be permitted to happen often. One method of solving your problem is to obtain the services of a skilled roll-maker.

Bertram G. Parker

E. E. Wright

T. H. Burke

H. M. Wilson

MEN of INDUSTRY

BERTRAM G. PARKER, president, Youngstown Foundry & Machine Co., Youngstown, O., recently was elected chairman of the Northeastern Ohio Chapter of American Foundrymen's association. Mr. Parker was born in Youngstown and was educated in the public schools of that city. Following one year in the laboratory of the Youngstown Steel Co., he became connected with the Youngstown Foundry & Machine Co. in 1898. In 1905 he was made secretary and treasurer; in 1921, general manager; and in 1930, president and general manager.

Mr. Parker has been active in the Northeastern Ohio chapter since its organization, serving 1 year as a director and the past year as vice chairman.

♦ ♦ ♦

E. E. WRIGHT has been appointed to take charge of the Cleveland office of Electro Metallurgical Sales Corp., New York. From 1918 until his present appointment, he has been with both the works and the sales departments of National Carbon Co. Inc. Both companies are units of Union Carbide & Carbon Corp.

♦ ♦ ♦

THEODORE H. D. BURKE, in charge of foundry research and development of alloy steel castings, Otis Elevator Co., Buffalo, has been elected chairman of the recently organized Buffalo chapter of the American Foundrymen's association. Upon leaving high school, Mr. Burke attended Pratt institute, College of the City of New York and Columbia university, specializing in engineering chemistry and metallurgy. In 1910 he entered the employ of the Isaac G. Johnson & Co., New York where he began his foundry career in gray iron, malleable and steel foundry practice. Later he served as master steel maker and metallurgist of that company. In 1923 he joined the Otis Elevator Co., Buffalo works, as foundry superintendent, chemist and metallurgist and later was detailed to foundry research and development of alloy steel castings. Mr. Burke is past president of the Buffalo chapter of the A. S. M. and is a member of the Institute of Mining and Metallurgical Engineers.

♦ ♦ ♦

RAYMOND C. BULLARD, advertising and publicity manager, Bullard Co., Bridgeport, Conn., has been elected to the board of directors of that company. After graduating from college, Mr. Bullard served 6 years as an engineering student in various departments of the company's manufacturing division. Following that, he spent considerable time in the sales engineering department and then was placed in the advertising department. He was appointed advertising and publicity manager in 1932.

♦ ♦ ♦

H. M. WILSON, recently elected president of the Pittsburgh Foundrymen's association, an organization with which he has been associated since his graduation, from college, was born in Pittsburgh in 1900 and attended the schools of that city. He received his advanced education at Pennsylvania State college, State College, Pa., from which he graduated with a bachelor of arts degree in industrial engineering. Mr. Wilson has been associated with Taylor-Wilson Mfg. Co., McKees Rocks, Pa. in various capacities since 1923 including the shops, sales and engineering departments and has been its president since 1933.

♦ ♦ ♦

JOHN KLUG, for 52 years connected with the Black-Clawson Co., in the capacity of assistant foundry foreman for 2 years and as foundry superintendent for the past 29, recently retired from active service. CLARENCE KLUG, his son, who has been connected with the Black-Clawson foundry since 1914, has succeeded his father as foundry superintendent.

♦ ♦ ♦

H. H. DOEHLER has been re-elected chairman of the board, Doehler Die Casting Co., Toledo, O. In addition to Mr. Doehler, the following have been re-elected: F. J. Koegler, president; L. H. Pillion, vice president in charge of eastern sales; A. G. Gutmueller, vice president and assistant to the president; W. G. Gutmueller, vice president in charge of Pottstown, Pa., plant; C. Pack, vice presi-

(*Continued on page* 42)

TRULINE BINDER

Reg. U. S. Pat. Off. by Hercules Powder Company

MANY core problems can be solved by the use of Truline. We maintain a completely equipped core laboratory and shall be pleased to consult with you about any core problems you have.

To those who visited our exhibit at the Foundry Show in Milwaukee last month, we demonstrated what Truline Binder will do. Various types of cores made with Truline were shown, and the reasons why these cores produce smooth, strong castings were explained.

Write to us for further information about Truline Binder and ask for a sample for test purposes.

HERCULES NAVAL STORES

HERCULES POWDER COMPANY
INCORPORATED

999 Market Street, Wilmington, Delaware

Branch Offices: Chicago, New York, St. Louis
Salt Lake City, San Francisco

JJ-16

(*Continued from page* 40)

dent in charge of research and development; R. Bernhard, treasurer; and F. Knoebel, secretary. E. R. Zabriskie, formerly western sales manager, has been elected vice president in charge of western sales.

♦ ♦ ♦

ROBERT J. LINNEY has been appointed general manager of the Chateaugay Ore & Iron Co., Lyon Mountain, N. Y.

♦ ♦ ♦

J. J. SUMMERSBY, assistant vice president, Worthington Pump & Machinery Corp., Harrison, N. J., has been made general manager of that corporation.

♦ ♦ ♦

HARRY S. HAZE has disposed of his interest in the White Rock Silica Co. of Illinois, selling agency for the White Rock Silica Co. of Wisconsin, and has severed his association with that organization.

♦ ♦ ♦

GEORGE B. WATERHOUSE, professor of metallurgy, Massachusetts Institute of Technology, Cambridge, Mass., has been nominated for national president of the American Society for Metals, to succeed Edgar C. Bain.

♦ ♦ ♦

DR. GILBERT E. DOAN, formerly associate professor of metallurgy, department of metallurgical engineering, Lehigh university, Bethlehem, Pa., has been made professor of metallurgy at that institution.

♦ ♦ ♦

C. E. SULLIVAN has been appointed vice president of the Foxboro Co., Foxboro, Mass. Mr. Sullivan has been connected with the company for 26 years and has occupied the position of sales manager since 1920.

♦ ♦ ♦

CHARLES ABELES recently joined the sales organization of the Easton Car & Construction Co., Easton, Pa., manufacturer of wheeled haulage equipment. Mr. Abeles will make his headquarters at the New York located at 10 East Fortieth street.

♦ ♦ ♦

M. A. BECKMANN has been added to the officers of Aluminum Industries Inc., Cincinnati, with the title of second vice president. H. J. HATER, formerly a vice president and treasurer, was re-elected treasurer. The following officers continue: JOHN ECKERLE, president; J. P. ANDRAE, first vice president; R. T. MESKER, secretary; and EUGENE F. ECKERLE, assistant secretary.

♦ ♦ ♦

CHARLES J. SIEGLE has been made general foundry foreman, Atlas Steel Casting Co., Buffalo, in charge of both open hearth and electric steel molding departments. Mr. Siegle is a practical and technical foundryman with 22 years of experience as an apprentice coremaker, molder, assistant molding foreman, general molding foreman and foundry superintendent in gray iron and steel foundries. He started his foremanship with the Canton Steel Foundry Co., Canton, O. Later he was made general foundry foreman of the Queen City Foundry Co., Denver. Mr. Siegle then was made general foundry foreman, Detroit Steel Casting Co., Detroit. Later he became foundry superintendent of the Hercules plant, Harnischfeger Corp., Milwaukee, and then he became connected with the Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.

Charles J. Siegle

♦ ♦ ♦

C. D. MORLEY, American Steel Foundries Inc., Alliance, O. was one of the speakers at the spring meeting of the Northeastern Ohio Vocational Association for Trades and Industries, held in Canton, O., May 22.

♦ ♦ ♦

HOWARD RAMSEY recently was moved to the Columbus, O., office of the Werner G. Smith Co., 2820 A. I. U. building. Mr. Ramsey served as a special apprentice and sand system foreman, the American Steel Foundries, Granite City, Ill. from 1923 to 1929. He then was made sand foreman and special engineer of the General Steel Castings Corp., Eddystone, Pa. In 1932 he was appointed superintendent of sand pits of the George F. Pettinos Inc., Philadelphia and 3 years later became special work and core room foreman of the General Electric Co., Everett, Mass. He joined the Werner G. Smith Co. in 1936.

♦ ♦ ♦

R. J. SOUTHWELL has been appointed sales manager, Andrew C. Campbell division, American Chain & Cable Co. Inc., Bridgeport, Conn., manufacturers of abrasive cutting and special machines.

♦ ♦ ♦

J. D. FENSTERMACHER, recently has been made manager of sales, steel castings and railroad sales division, Columbia Steel Co., San Francisco, E. S. DUVAL has been appointed manager of sales and F. R. STECKEL assistant manager of sales of alloy and stainless steel products.

♦ ♦ ♦

R. M. MARSHALL, secretary since 1935 of the Woodward Iron Co., Birmingham, Ala., has been made vice president. He will continue his duties as secretary. Before his association with the Woodward company in 1935, Mr. Marshall was vice president and general manager of the Sloss-Sheffield Steel & Iron Co.

♦ ♦ ♦

HENRY K. ARDINGER recently was made district sales manager of the Rochester Smelting and Refining Co. Inc., with headquarters in Warren, O. Mr. Ardinger represents the company in the sale of nonferrous metals in western Pennsylvania, eastern Ohio and northern West Virginia.

♦ ♦ ♦

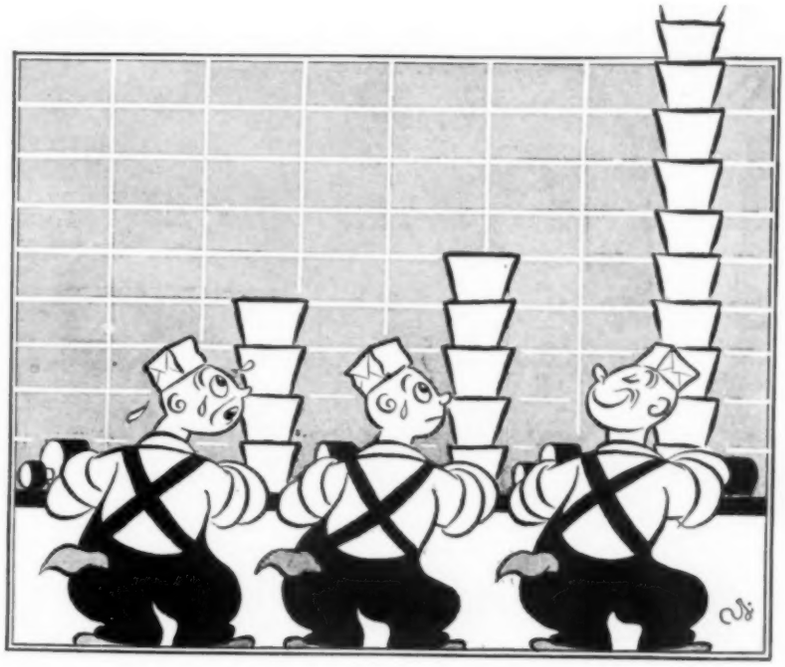
EDWARD L. BOHN, formerly affiliated with the North American Refractories Co., Cleveland, has been appointed sales manager, fire clay refractories division, of the Charles Taylor Sons Co., Cincinnati. Mr. Bohn graduated with a civil engineering degree from Rensselaer Polytechnic institute, Troy, N. Y., in 1915. Until 1923 he was connected with the Atlas Crucible Steel Co., Dunkirk, N. Y. (now Ludlum Steel Co.) as chief engineer. He was affiliated with the sales department of the Dover Fire Brick Co., Cleveland, from 1923 to 1929. Mr. Bohn worked in the same capacity for the North American company from 1929 to 1937.

♦ ♦ ♦

E. D. HERRICK, formerly chief engineer of the Lycoming Mfg. Co., Williamsport, Pa., and associated with that company for many years, has been appointed president. C. N.

(*Concluded on page* 44)

Why WILL HIGH CYCLE TOOLS INCREASE OUR PRODUCTION PER MAN ?



Because THEY MAINTAIN SPEED AND TORQUE UNDER LOAD

WORKMEN simply can't maintain high production speeds when the tools they use slow down under load. High Cycle Tools show only a 20% decrease of speed and torque between no-load and stalling points —while Universal and Pneumatic Tools show losses up to 60%. Consider what this means in increased production speeds, lower production costs and decreased operator-fatigue, particularly on tough nut-running, stud-setting, drilling, sanding and grinding jobs.

When you consider, too, that High Cycle Tools have a lower power cost, and lower maintenance cost on both tools and power systems, you'll readily see why manufacturers in fields where rapid, low-cost production is essential have changed over to Black & Decker-Van Dorn High Cycle Tools.

HOW MUCH WILL HIGH CYCLE TOOLS INCREASE OUR PER-MAN OUTPUT?

That's easy to find out definitely. Our High Cycle Engineers will be glad to study your production operations and give you an accurate report—without obligation on your part. For further information and catalog, write: High Cycle Division, Black & Decker-Van Dorn, 742 Pennsylvania Avenue, Towson, Md.

BLACK & DECKER-VAN DORN High Cycle TOOLS

DRILLS REAMERS SCREW DRIVERS NUT RUNNERS TAPPERS STUD SETTERS SANDERS GRINDERS DIE GRINDERS

Made by the World's Largest Manufacturer of Portable Electric Tools

(*Concluded from page* 42)

TULL has been elected vice president in charge of the Spencer heater division. Other officers named are H. D. STUEMPFLE, treasurer, J. ALAN SMEAD, assistant treasurer, and R. S. PRUITT, secretary. Directors of the company include R. H. FAULKNER, H. T. AMES, E. D. HERRICK, SETH T. MCCORMICK JR., Mr. Tull and Mr. Pruitt.

• • •

WALTER J. KOHLER, formerly president of the Kohler Co., Kohler, Wis., has resigned to become chairman of the board of that company. He has been succeeded as president by his brother, HERBERT J. KOHLER. Other new officers elected include: Vice president, O. A. KROOS, formerly secretary and treasurer, and H. J. THORKELSON, assistant to the president since 1928; manager of the Chicago office JOHN M. KOHLER, formerly treasurer; and secretary WALTER J. KOHLER JR.

Birmingham Chapter Elects Officers

The annual meeting of the Birmingham chapter of the American Foundrymen's association, was held at the Thomas Jefferson hotel, Birmingham, May 21, with L. N. Shannon, Stockham Pipe Fittings Co., chairman of the chapter, presiding. The program committee outlined plans for the final meeting of the year which will be a picnic given by A. S. Holberg in commemoration of the fiftieth anniversary of the establishment of the Alabama Clay Products Co. R. L. Ogden, reporting for the membership committee, read the names of three new members.

The following officers were elected for the coming year: Chairman, R. R. Deas Jr., American Cast Iron Pipe Co.; vice chairman, W. L. Roueche, McWane Cast Iron Pipe Co.; secretary-treasurer, R. C. Harrell, Stockham Pipe Fittings Co.; directors, A. P. Finch, National Cast Iron Pipe Co.; J. M. Franklin, Central Foundry Co., Holt, Ala.; Frank Hamilton, Alabama Pipe Co., Gadsden, Ala.; S. B. Murray, A.B.C. Coal & Coke Co.; J. E. Reynolds, U. S. Pipe & Foundry Co., Bessemer, Ala.; L. N. Shannon, Stockham Pipe Fittings Co.; and E. A. Thomas, Thomas Grate Bar Co.

C. E. Bales, vice president, Ironton Fire Brick Co., Ironton, O., presented an interesting discussion on the manufacture of fire bricks. He also showed slides of furnaces and ladles in which these bricks are used. A good discussion followed the talk.

Probes Centrifugal Casting Practice

A. E. Falk, metallurgist, D & M Machine Co., Torrance, Calif., spoke on "Centrifugal Castings" at the regular meeting of the Southern California Foundrymen's association held May 27 at the Clark hotel, Los Angeles. Mr. Falk presented an interesting and comprehensive paper, illustrating his points with slides.

The development of centrifugal casting practice from an early British patent in 1809 to the present status leads Mr. Falk to predict that this process will be of greater importance in the future. The record of his company in delivering castings to the machine shop for less than 3 cents per pound and pouring from 14,000 to 20,000 pounds of metal into one set of molds indicates the extent to which the problems have been solved.

Ed Green, chairman of the membership committee, announced that the group has 56 members and expects to have 100 by the June meeting. Temporary chairman, Robert Gregg appointed a nominating committee consisting of G. W. Merrefield, Kay-Brunner Steel Castings Co., chairman; J. H. Wilkins, Vernon Foundry Co., and Earl Anderson, Enterprise Foundry Co. Meetings are to be held on the fourth Thursday of each month.

Complete Standards For Dust Control

Standards of dust control practice rapidly are nearing completion by the engineering committee of the Dust Control Equipment association, according to announcement by Arthur J. Tuscany, executive secretary of the association, Penton Building, Cleveland.

At a number of meetings of the committee agreement has been reached on many questions which previously have been in doubt, thus clarifying relationship not only between purchaser and seller but between interests concerned with the dust hazard question.

The Dust Control Equipment association has arranged for representation of the engineering committee on the American Foundrymen's association safety and hygiene committee and the Air Hygiene foundation, and request has been made for representation on the American Standards association committee Z-9, which is giving attention to the development of fundamentals relating to the design of exhaust systems.

Mr. Tuscany directs attention to the fact that neither the Dust Control Equipment association nor its engineering committee propose to prepare codes, but it is further pointed out that the service, advice or assistance of the committee is available to any group which is interested in going into the dust control question.

A.S.M.E. Nominates

American Society of Mechanical Engineers has nominated the following for officers during 1938: President, H. N. Davis, Stevens Institute of Technology, Hoboken, N. J.; vice presidents—for one year, F. O. Hoagland, Pratt & Whitney division, Niles Bement-Pond Co., Hartford, Conn.; for two years, B. M. Brigman, Speed Scientific school, University of Louisville, Louisville, Ky.; Harte Cooke, McIntosh & Seymour Corp., Auburn, N. Y.; W. H. McBryde, consulting engineer, San Francisco; L. W. Wallace, Association of American Railroads, Chicago; Managers to serve three years, Carl Bausch, Bausch & Lomb Optical Co., Rochester, N. Y.; S. B. Earle, School of Engineering, Clemson A. & M. college, Clemson College, S. C.; and F. H. Prouty, Prouty Brothers Engineering Co., Denver.

Moves Office

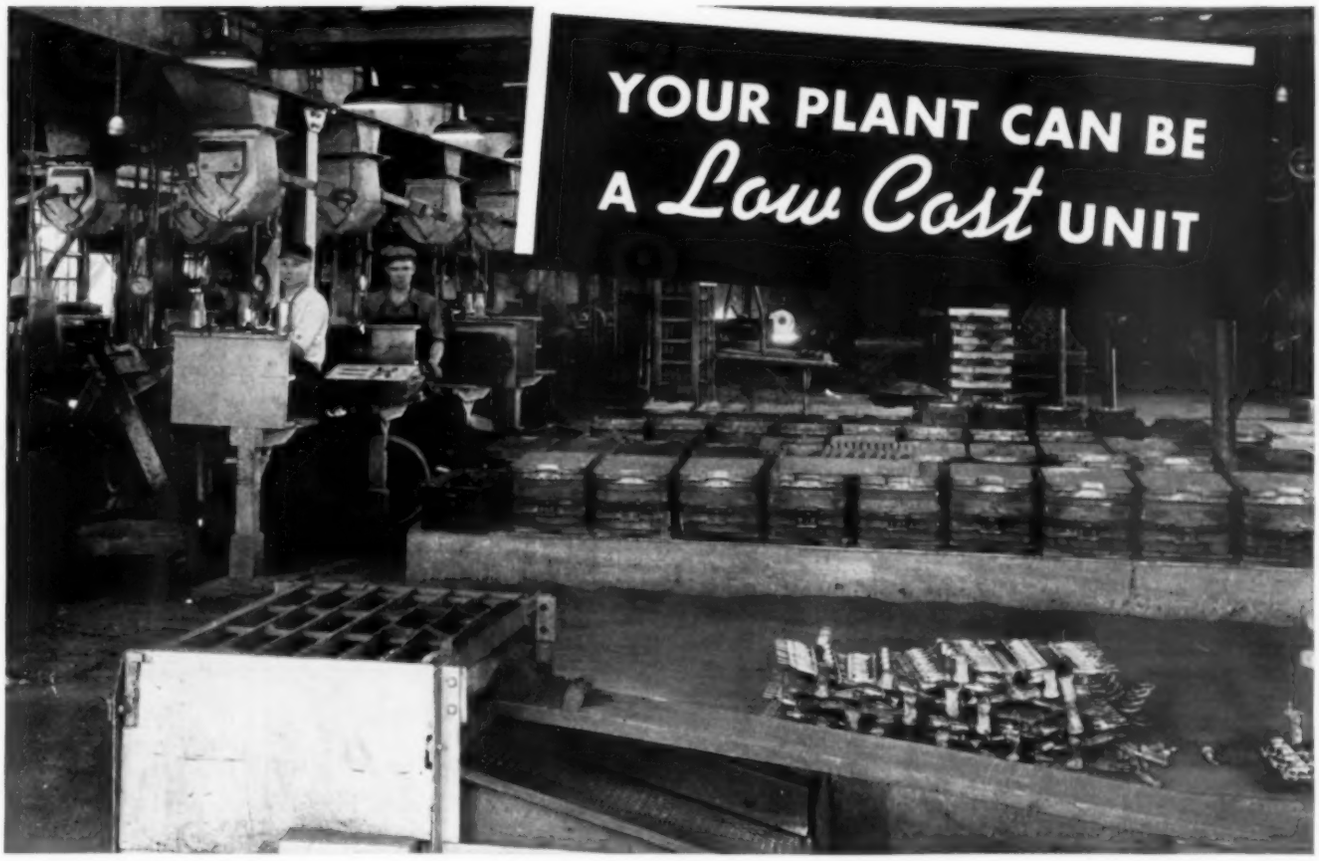
C. O. Bartlett & Snow Co., Cleveland, has removed its New York office to room 404-E, 30 Church street. C. W. Ross, who has represented the company's foundry, drying, conveying and coal handling equipment in that territory for over 12 years, will continue as district manager.

Opens Branch

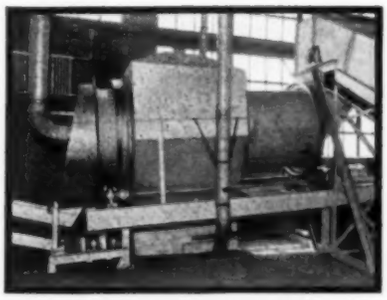
Cutler-Hammer Inc., Milwaukee, recently has opened a branch office at 624 Santa Fe building, Dallas, Tex. The new office will handle the sales of electric control apparatus, including magnetic clutches and brakes, magnets, valve control, safety switches and service equipment. A stock of standard apparatus also will be carried.

Is Distributor

Welding Equipment & Supply Co., 2720 East Grand boulevard, Detroit, has been made distributor of welding and cutting equipment and accessories made by the Torchweld Equipment Co., Chicago, in the state of Michigan. A stock of equipment and service parts will be carried.



LET BARTLETT-SNOW ENGINEERS MAKE FOR YOU THE SAVINGS THEY HAVE MADE FOR OTHERS



BARTLETT-SNOW REVOLVING SCREENS . . . dust tight . . . for overhead or floor mounting. Standard sizes to meet any requirement.

BULLETIN No. 75. Complete with 120 illustrations and 26 engineering diagrams, this 44-page booklet describes the Bartlett-Snow method of securing less costly; more efficient operation. Send for one!

• A doubled or sometimes trebled out-put from the same or smaller floor space . . . in shorter time . . . with fewer rejections . . . and at lower cost . . . these are just a few of the many advantages that are achieved with a Bartlett-Snow sand-handling and sand conditioning system.

Conceived by Bartlett-Snow foundry engineers and reflecting the more than 30 years of cumulative improvements that are available only in this design, Bartlett-Snow foundry equipment is demonstrating repeatedly the superiority that comes from greater experience in foundry work.

Let us show you what Bartlett-Snow sand handling and sand conditioning equipment is doing in reducing costs for large and small, jobbing and production, brass, aluminum, steel, malleable and grey iron foundries—and what it can do for you. The investment for equipment need not be large. What are your foundry problems?

THE C. O. BARTLETT & SNOW COMPANY

In New York: 30 Church Street

6201 Harvard Ave. Cleveland, Ohio

In Chicago: First Nat'l Bank Bldg.

BARTLETT • SNOW

SAND HANDLING AND SAND CONDITIONING EQUIPMENT
MOLD CONVEYORS AND ACCESSORY FOUNDRY EQUIPMENT

OSBORN
MOULDING MACHINES

contributing to the
"PROVEN VALUES"
OF FLORENCE RANGES AND HEATERS

• A 65-year policy of *"selling products on their merits . . . on facts alone,"* has built the highly successful business of the Florence Stove Company, Gardner, Mass.

Insistent upon highest standards in their own products, the Florence Stove Company must have equally high standards in the equipment used in their manufacturing processes.

22 years ago, the Florence Stove Company started using Osborn Moulding Machines. More were added over the years. A few months ago, a new battery of 15 Osborn No. 275-J Jolt Squeezers went into action for Florence Stove Company. Again . . . TIME PROVES VALUES in Osborn Moulding Machines!

Before YOU invest in moulding machines . . . let Osborn show YOU how TIME PROVES VALUES!

THE OSBORN MANUFACTURING COMPANY
5401 HAMILTON AVE., CLEVELAND, OHIO, U. S. A.
AGENCIES LOCATED STRATEGICALLY ALL OVER THE WORLD

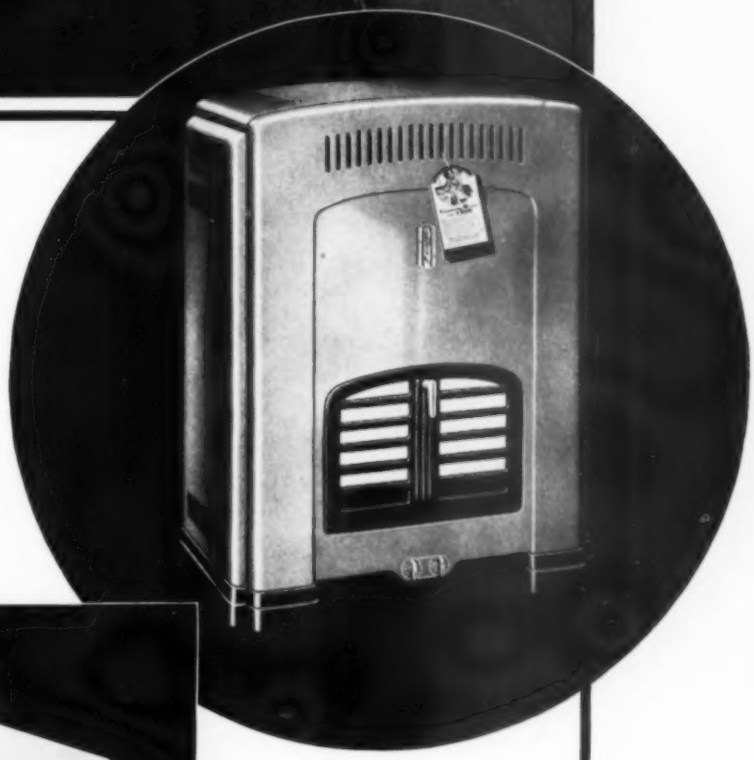
TIME PROVES VALUES

OSBORN

Uniformly high quality moulds are produced on Osborn No. 275-J Jolt Squeezers in the foundry of the Florence Stove Company, Gardner, Mass. Important advantages of Osborn Jolt Squeezers are:

1. Adjustable features and open end construction which provide quick adaptability to a wide range of flask sizes and shapes.

2. Rugged, accurate construction. Quick accessibility to the few parts requiring maintenance. Minimum production delays. Low upkeep costs.



(Above) One of a complete line of Florence Oil-Burning Heaters.

(Left) One of the modern Florence Oil Ranges distinguished for outstanding performance and beauty of design.

The annual banquet arranged by the Milwaukee committee was one of the largest in the history of the association

Nonferrous Problems Evoke Lively Discussion

THE old but ever new subject of molding sand engaged the attention of a large group of nonferrous foundrymen at a Thursday session held under the chairmanship of H. M. St. John, Detroit Lubricator, Detroit. William Laird, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., acted as vice chairman. In presenting a paper on practical application of sand control in nonferrous foundries, A. C. Arbogast, Northern Indiana Brass Co., Elkhart, Ind., stated that a great deal of trouble would be avoided if foundrymen consistently ordered their sand from experienced reliable sources, tested it regularly and operated the shop under the direction of a superintendent with the necessary practical and technical experience to interpret the results of the tests.

With a supply of two grades of sand the foundryman is in position to handle castings ranging in weight from an ounce or two up to 30 pounds. Fine sand with A. F. A. fineness 188 and clay 13 per cent is suitable for light castings. For the heavier castings the fineness may be 170 and the clay content 18 per cent. For special castings and in-between weights a suitable mixture may be prepared by mixing the sands in various proportions. Under routine operating conditions a check twice a week is sufficient to determine the fineness, permeability, moisture and green strength. Since a system of sand testing was installed in his plant, the speaker claimed a decided improvement had been noted in the quality, surface appearance and other characteristics of the castings. The loss of castings had been reduced to 0.75 per cent.

In a paper entitled "Fundamental Considerations in Nonferrous Sand Control," the author G. K. Eggleston, Detroit Lubricator Co., Detroit, first traced the geological history of molding sands showing how deposits were formed. He discussed grain distribution and explained the system adopted by the A. F. A. for designating different grain sizes. This was followed by an explanation of the effect of grain size on permeability, the importance of the clay content and the various properties of clays. Benefits of sand control were listed and discussed. The final section of the paper was devoted to a description of the control methods practiced at the plant with which the author, Mr. Eggleston, is connected.

Convention Data

DUE to the many activities at the recent Milwaukee convention of the American Foundrymen's association, space limitations prevented the publication of all the reports in the May issue of The Foundry. Therefore, the reports on nonferrous practice, malleable cast iron, refractories, foundry costs and on sand are presented in this issue.

Sand Is Finer

In the discussion which followed the presentation of the two papers, a member claimed that he had some trouble with his castings after he had installed a muller for the preparation of the sand. H. W. Dietert, H. W. Dietert Co., Detroit, stated that sand used in brass foundries usually is much finer than sand employed in iron and steel foundries, therefore a lighter mulling action is required and in addition the sand should be aerated after it leaves the muller. He stated that operated under proper conditions,

(*Continued on page* 50)

SLY FOR LOWER COSTS

CLEANING EQUIPMENT

Sly Blast Room

Below: Sly Dust Filters

Sly Tumbling Mills

Sly PURAIR Helmet (air-supplied)

BLAST CLEANING EQUIPMENT

•

TUMBLING MILLS

•

DUST CONTROL SYSTEMS

•

ABRASIVES

•

HELMETS

Accumulated experience of more than three score years is embodied in Sly equipment. Sly has everything in improved design — simplicity for low first cost; highest operating efficiency; lowest maintenance cost; rugged construction of quality material for extremely long service.

The W. W. SLY Manufacturing Co.

4703 Train Avenue. Cleveland. Ohio.

(*Continued from page* 48)
the muller is an effective sand preparation unit.

Touching on the item relating to the removal of fines a member stated that he had attached a 12-inch pipe above the elevator of his sand preparation installation and the natural draft removed the fines satisfactorily.

H. W. Dietert presented a paper prepared in collaboration with Earl Woodliff, dealing with a detailed study of sand for nonferrous foundries. The paper was based on returns from a questionnaire sent to a considerable number of foundries requesting sand samples and information regarding the class of work handled. The survey covered aluminum, brass, bronze, copper and copper-nickel. Compilation and distribution of the various items presented on a large chart included: Sample number, moisture, permeability, green shear strength, green compression, deformation, resilience, dry compression, clay content, sand, type of molding, type of mixer, riddle size, method of ramming, mold protection, finish, weight, thickness, temperature of metal, venting.

Have Lively Discussion

A lively discussion of several brass foundry problems followed the nonferrous roundtable luncheon held Thursday noon under the direction of C. V. Nass, Fairbanks-Morse Co., Beloit, Wis. One problem related to a pin-holed surface on a water faucet made from an alloy containing approximately 81 per cent copper, 2.5 per cent tin, 5.5 per cent lead and 11.0 per cent zinc. The sand employed had a fineness of 205 and a strength of 4.2 pounds, and several stated that it apparently was too fine and weak. Changing to a sand with a fineness of 160, and higher strength was suggested, as was a change to an alloy composed of 86 per cent copper, 4 per cent tin, 4 per cent lead, and 6 per cent zinc. Other recommendations to eliminate the pinholing referred to gating. The method in use gated at the spout end straight on while those suggested included gating in the flange, at the end to be threaded, and placing the faucet at an angle so that the molten metal would flow along the core rather than to break abruptly against it causing stream turbulence.

Another problem related to a bushing about 14 inches long, 4¼ inches outside diameter with a ⅝-inch metal thickness in which porosity and pinholing were encountered adjacent to the core. The casting was made two up, poured horizontally, and gated from a central runner with four branches into the two castings near the ends. One suggested remedy was to increase the phosphorus content to promote greater fluidity, but not so much so that other troubles were encountered. Changes in gating also were recommended. One method was to gate at the sprue end alongside the core. Another was to gate into the end opposite the sprue using a riser close to the gate itself. Other suggestions were to use risers near the gates without changing from the method in use.

Should Eliminate Manganese

In a discussion about nickel-silver castings containing 20 per cent nickel which were porous and dirty, it was recommended that manganese be eliminated as a deoxidizer, and that magnesium be employed. The pouring temperature should be around 2350 or 2400 degrees Fahr., and no coating should be used on the cores. It was pointed out that carbon has a deleterious effect on nickel, and most core coatings either contain carbon or apparently gave off gas which caused defective castings. Further, attention should be given to the fuel to see that the sulphur is low. Fuel oil should be held to 0.5 per cent or under in sulphur. The final problem presented was an aluminum cover which had a depression or slightly hollow place on the top, and some small holes near the gates. Opinion was that perhaps the mold had been rammed a little too hard where the depression occurred, and that the holes resulted from gas or air being carried into the mold through too high pouring, turbulence, etc. Trial of square sprues was recommended as a remedy for swirling.

The final session on nonferrous practice was held Friday morning with Harold J. Roast, Canadian Bronze Co., Montreal, and T. C. Watt, Falcon Bronze Co., Youngstown, O., as chairman, and vice chairman respectively. The first paper was presented by T. E. Kihlgren, International Nickel Co., Bayonne, N. J., on the production of pressure tight castings in the 30 per cent nickel-70 per cent copper alloy.

That involves melting under slightly oxidizing conditions, and deoxidation with about 1 per cent manganese, and from 0.25 to 1 per cent silicon, followed by desulphurizing with 0.03 to 0.05 per cent magnesium. Pouring temperature of the alloy ranges from 2500 to 2650 degrees Fahr., depending upon the section thickness of the castings. The sand should be refractory and open, and careful attention must be given to gates and risers to insure solid castings.

Castings May Crack

W. E. Ball Jr., Edna Brass Co., Cincinnati, O., in discussing the paper, asked for information on creep tests at elevated temperatures which might indicate the applicability of the alloy for high steam pressure and temperature work, and the reply was that nothing had been done on that phase as yet. J. J. Kanter, Crane Co., Chicago, said that unless silicon and tin contents of the alloy for solder fittings are maintained so that the aggregate percentage is 1 per cent or under, the hot ductility of the alloy is impaired, and the castings crack. Also with higher silicon the ductility at elevated temperatures is much more sharply affected than with lower silicon content.

L. E. Hallowell, H. Kramer & Co., Chicago, pointed out that there is no sharp demarcation between the cupro-nickel and the copper-nickel-zinc alloys. However, in the latter silicon that can be used is quite limited especially when lead is present. Usually silicon is 0.10 per cent or under. E. F. Hess, Ohio Injector Co., Wadsworth, O., inquired about hardness of the alloy, and what effect different sands would have. It was pointed out that alloy ranged from 90 to 190

(*Concluded on page* 53)

Patterns and castings from all parts of the country were entered for judging in the apprenticeship contest

ADVERTISING PAGES REMOVED

(*Concluded from page* 50)
brinell, and that it increased and decreased with the tensile strength. As far as sands were concerned, there was probably not much leeway as the high pouring temperature involved necessitated a highly refractory sand.

The second paper by G. E. Stoll and A. T. Ruppe, both at Bendix Products Corp., South Bend, Ind., discussed the x-ray as an aid in the manufacture of aluminum castings, and was presented by Mr. Stoll. In this the authors described the application of x-rays in determining the production technique for an airplane carburetor.

William Romanoff, H. Kramer & Co., Chicago, presented the report of the committee on analysis of casting defects, stating the material developed by the committee will be available in printed form in the near future. In a discussion as to the final arrangement of the report, a showing of hands indicated that the preference was for presentation in a chart form. H. J. Rowe, Aluminum Co. of America, Cleveland, presented the report of the committee on recommended practices, and said that work is underway on practices for high lead bronzes, manganese bronze, valve metal, and red brass.

The final paper of the meeting was presented by H. J. Roast, and was entitled, "Problems in Bronze." Mr. Roast discussed shrinkage in silicon bronze, and pointed out how it was overcome in a heavy casting weighing 400 pounds by using a riser that weighed as much as the casting. He described the standard keel block for control test bars, segregation, experiments on gating to insure the best procedure, and other phases of nonferrous foundry problems. He also mentioned that stearic acid could be used for experimental work as it had approximately the same shrinkage as aluminum bronze and steel.

Properties of Malleable Are Investigated

PROPERTIES of fully annealed and heat treated malleable iron was the subject of a paper prepared by R. Schneidewind and A. E. White, University of Michigan, Ann Arbor, Mich., and presented by Mr. Schneidewind at a meeting presided over by P. C. DeBruyne, Moline Malleable Iron Co., St. Charles, Ill. and E. A. Gullberg, Deere & Co., Moline, Ill.

The paper, profusely illustrated with tables and micrographs, contained the results of an unusually thorough investigation of the subject as conducted in the department of engineering research, University of Michigan.

A study was made of the properties of malleable iron in the fully annealed and in two heat treated (quench and draw) conditions. The purpose of the investigation was two-fold, to determine whether quick anneal white irons for malleableizing could be purchased successfully on the basis of chemical specification and second, to present rather complete physical property data for the designing engineer. It was found that three irons purchased on chemical specification varied somewhat with regard to the rate of breakdown of the cementite, but the tensile values and moduli of elasticity of the three irons showed quite fair agreement.

Properties in tension, compression, torsion, bending, fatigue, impact and hardness were determined at room temperatures. The results of the irons in the heat treated condition showed strengths which should prove attractive for many types of service. The torsion properties, due to the presence of temper carbon, are not so favorable. Tension and impact values were determined at temperatures of 400 and 800 degrees Fahr.

Microstructures of the quenched and drawn samples showed a spheroidized matrix which was compared with the pearlitic structure obtained by slowly cooling through the critical stage. Effects of a few alloys on the structure of slowly cooled irons also were shown.

Replying to remarks by J. W. Hamilton, Vanadium Corp., the speaker admitted that small surface defects on the test bars might be responsible for more or less variation in the results. Carl Joseph, Saginaw Malleable division, General Motors Co., stated that his company produces a quick anneal metal regularly with elongation up to 5 per cent and tensile strength over 85,000 pounds per square inch.

Report of a committee appointed by the Malleable Iron society to conduct an investigation on the effect of the carbon content on shrinkage of malleable iron was presented by James H. Lansing. Eight foundries co-operated in supplying the material for the tests. Pig iron in the charges varied from 10 to 40 per cent. Metal was poured at temperatures ranging from 2700 to 2775 degrees Fahr. Carbon content of the castings ranged from 2.00 to 2.75 per cent. In the preliminary castings all samples showed slight shrinkage at the gates and under the risers. However, the speaker pointed out that a change in the gating system eliminated this form of defect. Net result of the investigation showed that the carbon content does not affect the shrinkage factor. Many other variable factors are responsible, but all are amenable to good foundry practice.

Discuss Melting Problems

L. N. Shannon, Stockham Pipe Fittings Co., Birmingham, Ala., and D. Porter Spencer, Belle City Malleable Iron Co., Racine, Wis., presided over the Wednesday morning session on malleable foundry practice where three papers were presented. The first, "Developments in Melting Malleable Cast Iron," was presented by W. R. Bean, Whiting Corp., Harvey, Ill. The second, "Selection of Cycle and Furnace for Annealing Malleable Iron," was prepared and submitted by A. F. Landa, engineer Central Scientific Research institute of machine building, Moscow, U.S.S.R. This paper was presented in abstract by Carl Joseph, Saginaw Malleable Foundry division General Motors Corp., Saginaw, Mich. The third paper "Sand Control in a Malleable Foundry," was prepared and delivered by Elmer C. Zirzow National Malleable & Steel Castings Co., Cleveland.

In discussing the developments in melting malleable iron Mr. Bean confined his remarks to the period between 1912 and the present. He referred to the fact that the late B. J. Walker, Erie Malleable Iron Co., Erie, Pa., was the first to employ the natural draft furnace extensively. This furnace in use in 1900, had a capacity of 30 to 40 tons, the largest type in use up to about 1925. At present furnaces are in use which produce heats up to 75 and 80 tons. In direct contrast he also referred to what is probably the smallest air furnace in the United States. This furnace in New England had a capacity of 5 tons until recently when it was converted into a pulverized fuel type unit and the capacity of the unit raised to 8 tons.

Two outstanding developments had their inception between 1912 and 1914 but a number of years passed before they were employed extensively. One is the duplexing method and the other is the use of powdered coal as a fuel. Later in the discussion period he stated that at present only approximately 15 per cent of the furnaces in this country are hand fired. The remainder use either oil or pulverized coal fed to the furnace mechanically.

In the duplexing process he advocated melting the iron as cold as possible, say about 2500 degrees Fahr., to minimize the carbon and sulphur pickup. In one installation melting approximately 200 tons per day it is claimed that the coke consumed in the cupola amounts to 183 pounds per ton of iron melted for duplexing.

Answering a question in regard to the relative cost of electric and coal firing in the second furnace in a duplexing unit, he stated that several factors must be taken into consideration, but that generally speaking the electric furnace is the more expensive. In the duplexing process the temperature is raised thereby promoting better graphitization. Replying to a question on the amount of carbon pickup in the cupola, he stated that is a negligible factor, since the carbon content is decided by the manipulation of the metal in the second furnace in the duplexing unit. One and probably the chief reason for the passing of the camel back furnace in favor of the straight roof, is that the straight roof is easier to work. At present he estimated that not more than 5 per cent of the furnaces in this country are of the camel back type.

In the paper by A. F. Landa the author claimed that after an extensive investigation he had arrived at the conclusion that there is no accelerated annealing of malleable, but rather an optimum annealing cycle, dependent upon the iron to be annealed and the furnace equipment available. Cycles can be reduced by lowering the nonproductive time during which annealing is not taking place.

The paper by E. C. Zirzow presented a detailed description of sand control as practiced in the plant with which he is connected. Factors of molding sand control were listed after which an outline of the mechanical method of handling the molding and core sand was rescribed.

The roundtable luncheon of the malleable division, held Wednesday noon, was attended by approximately 150. In the discussion that followed, several phases relating to the industry were discussed. Developments in annealing furnaces were described, and included the recently installed continuous and batch type, radiant tube furnaces. With the continuous type unit, annealing is accomplished in 35 or 36 hours, while in the batch type furnace the cycle occupies 48 to 50 hours. Both furnaces discussed are gas-fired and it was stated that the continuous furnace requires approximately 2700 cubic feet of gas while the batch type requires about 3300 cubic feet of gas per ton of castings treated.

Mention was made of an investigation of porosity as indicated on a series of X-shape bars poured under controlled conditions in several foundries. The bars had arms ½-inch square and ¼ x ½-inch section to simulate unequal sections adjoining each other. Some had only one size of section. Results obtained from measurement of the porous area in the center indicate that the relation between porosity and temperature is almost too small to measure, and the same was true concerning the relation between carbon content and porosity.

Replies to a question on melting two heats a day in one furnace indicate that some difficulty is encountered in meeting an 8-hour schedule unless the heats are 18 tons or under. Usually 9 to 9½ hours are required. However, if sufficient molds were made in the afternoon and allowed to stand over night, the first heat could be poured early, and an 8-hour schedule maintained. One speaker stated that with 18-ton heats, his firm allowed a 2-hour lunch period which resulted satisfactorily. Discussion of fields of use for pearlitic malleable iron indicated that it was being employed to replace some steel forgings such as wrenches, connecting rods for small compressors, for rocker arms, small cast or forged gears. In the case of forging replacement, pearlitic malleable castings could be cast closely to size so that machining was at the minimum or eliminated.

Study Refractories And Their Applications

REFRACTORY materials and their applications in foundries were considered at a session devoted exclusively to the subject. Three technical papers were presented and a committee report submitted. John Lowe, assistant metallurgist, Campbell, Wyant & Cannon Foundry Co., Muskegon Heights, Mich., and A. H. Dierker, research engineer, engineering experiment station, Ohio State university, Columbus, O., served as chairman and vice chairman, respectively of the session.

Two of the papers dealt with insulating refractories, one with their manufacture and physical properties, the other with their service properties and applications. In the former, G. A. Bole, research professor of ceramic engineering, Ohio State university, Columbus, O., quoted the A.S.T.M. definition of insulating firebrick as "a product with low heat conductivity suitable for use as a lining for furnaces."

Use of insulating firebrick has come about so rapidly that methods of manufacture and specifications for use have not been standardized, said Mr. Bole. Large savings reported in fuel consumption and in time of heating up a furnace have made the average furnace operator question whether a new unit should be built of this new type refractory.

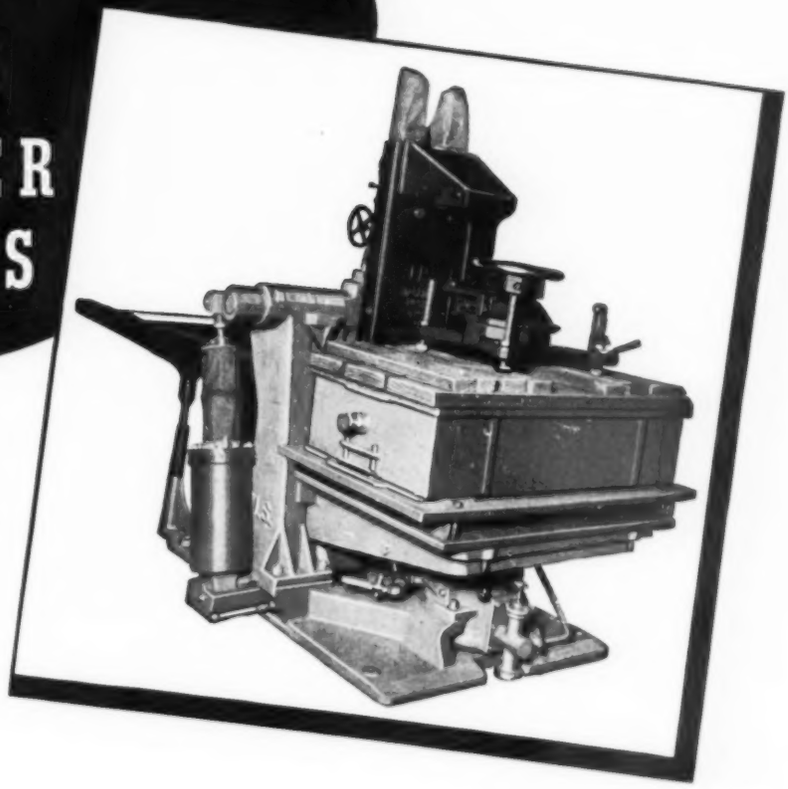
Also, Mr. Bole pointed out these refractories cannot be used in contact with slags and therefore are unsuited

(*Concluded on page 56*)

Modernize Your Foundry . . .

with these

MODERN ROLL-OVER MACHINES



THERE'S NOTHING LIKE THEM FOR CUTTING MOLDING TIME and MOLDING COSTS

● No pits are needed. The center clamping and open end table handles overhanging flasks to the full tonnage capacity of the machines. Two roll-over cylinders, operating reciprocally, prevent stopping on center. Dash-pot control eliminates banging and dropped molds. Complete with an adjustable roll-out table, and a pattern draw that requires no unclamping or equalizing, these Johnston & Jennings machines give you *all* the advantages of air jolt, air clamp, air leveling, air roll-over, air pattern draw . . . and all the savings . . . in one machine. Send for a copy of the fully descriptive folder. It'll give you all details. What are your molding machine requirements?

THREE STANDARD SIZES			
Machine No.	Roll-Over Table	Flask Capacity in Lbs. (at 80 lb. air)	Pattern Draw
610	24" x 30"	600 lbs.	10"
815	30" x 40"	1200 lbs.	15"
918	40" x 48"	2000 lbs.	18"

The JOHNSTON & JENNINGS *Co.*

Addison Road and N.Y.C. Tracks

CLEVELAND . . . . . OHIO

(*Concluded from page* 54)
for furnace bottoms; they have poor resistance to abrasion which would render them unsuited to certain uses; they are pervious to air and this could be a drawback in certain construction; and they have relatively low resistance to spalling which might be a limiting factor.

Much valuable information on service properties of insulating refractories was contained in the paper by A. V. Leun, refractory engineer, Bethlehem Steel Co., Bethlehem, Pa. He described several furnace installations and gave comparative figures on operation and several brands of brick. Conclusions he gave as follows:

"Application of insulating refractory brick to furnaces such as forge, car-bottom, reheating and treatment will result in great fuel savings. Where slag attack or abrasion is a factor, use of fireclay brick is advised in those wall sections where these attacks occur. Insulating refractory brick are rapidly eroded and worn away by either slag attack or abrasion.

"It is recommended that all brick be laid and sprayed with a suitable high temperature cement. Care should be exercised to allow sufficient room for expansion in the walls.

Insulated Brick Roofs

"Use of suspended insulating refractory brick roofs has become an accepted fact. Due to their texture, it is recommended that the suspension medium be in the brick. External suspension of the brick will cause early failure.

"Operation of a furnace built of this class of brick is different than with a fireclay construction. When raising the temperature of a furnace built of insulating brick, far less actual heat input is necessary than when using fireclay brick for the same temperature increase. When cooling down, fireclay brick, having a high heat content, will allow for a slower furnace temperature drop than will insulating refractory brick. Where a slow drop is desired, it is necessary to maintain fuel input higher with insulating brick than with fireclay brick."

Difference of opinion existed as to the desirability of using a refractory coating on insulating firebrick. Mr. Bole said tests indicated little advantage was gained by the coating; Mr. Leun recommended use of the coating. One refractories maker advocated the practice for the reason that it reduces penetration of gases. Elaborating upon his views, Mr. Leun said his company used the coating for three reasons: (1) To reduce penetration; (2) to protect surface of the brick from abrasion of iron particles swirling about in furnace atmosphere; (3) to give a glaze which is a poor receiver of radiated heat. The last item was of most importance, he said.

J. L. Allison Jr., Babcock & Wilcox Co., New York, complimented Mr. Bole for advocating that service tests on insulating firebrick be standardized. To obtain comparable heat conductivities of various brands of brick, the brick must be tested by the same method.

Use of firestone as a refractory was discussed in a paper by Harry Rayner, foundry metallurgist, Chrysler Corp., Detroit. This naturally formed material has a granular structure and chemical analysis coupled with a colloidal silica bond which gives it great resistance to fire and abrasion. The rock is split easily and cut to desired shape.

The speaker's paper dealt principally with use of the material for lining cupolas and stated that because of its economy its popularity is growing rapidly. Cupola runs are increased by the material. Among other uses of firestone which have been found practical, Mr. Rayner listed lining of bull or crane ladles, pig iron mixers, bessemer converters and soaking pits.

E. J. Carmody, metallurgist, National Superior Co., Springfield, O., reported on the work of the joint committee on foundry refractories. This dealt principally upon standardization efforts.

Foundry Cost Methods Receive Attention

FOUNDRY cost methods with reference to malleable, gray iron and nonferrous foundries were treated in detail at the management session on Wednesday. Chairman Sam Tour, Lucius Pitkin Inc., New York, made brief comment on the foundry cost investigations made in connection with the work of the A. F. A. and introduced R. E. Belt, Malleable Founders' society, Cleveland. Mr. Belt discussed cost methods in the malleable industry, emphasizing the preparation of a predetermined cost in advance of quoting. Direct costs, the first step in his system, were described as well as indirect costs.

The arrangement of accounts in a cost system and bases of application of indirect costs were presented in a comprehensive manner by Mr. Belt. The procedure in determining the factors of indirect costs, through the establishment of a cost formula, were of interest in the talk. According to the speaker, a cost formula having been set up, a clerk with calculating machine experience can prepare a cost estimate in a short time. Practice generally followed in the industry is to determine piece prices of direct labor operations, he stated.

Mr. Belt, in reply to a question from Mr. Tour, stated that the setting up of the system in a plant involves little more than rearrangement of the cost accounting already in use at the plant. J. J. Witenhafer, Lake City Malleable Co., Cleveland, remarked that a comptometer operator in that firm handled 80 to 90 estimates per day under the system related by Mr. Belt. Peter E. Rentschler, Hamilton Foundry & Machine Co., Hamilton, O., contributed to discussion on the application of direct labor cost in a foundry system.

Interpreting a cost estimating procedure applied in the gray iron industry, William J. Grede, Liberty Foundry Co., Milwaukee, stated that it was more difficult to use than that developed for malleable iron because of a wider range of work and a larger number of units to set up. The history of cost accounting in the gray iron industry was propounded by the speaker, starting in 1928 with the formation of the Gray Iron institute and the development of a system through the co-operation of the A.F.A. He recommended that cleaning expense be handled separately and referred to the method of figuring core costs by weight of core material. A definite need for a simple system was supplied by a publication in July, 1936, of the Gray Iron Founders' society, according to Mr. Grede. He urged the general adoption of that system, either in whole or part and emphasized the importance of accurate estimating rather than guesswork.

Mr. Rentschler said that cleaning costs in the Hamilton company were well in excess of the combined molding and core costs. He advocated a simplified system. R. O. Flanders, Blue Valley Foundry Co., Kansas City, Mo., made a few remarks on the installation of the system there, its operation, etc.

James L. Wick Jr., Falcon Bronze Co., Youngstown, O., president of the A.F.A., presented an interesting discussion on nonferrous foundry cost methods, using a large chart. He compared the system of the Falcon company as a refinement of a

(*Concluded on page* 59)

ADVERTISING PAGES REMOVED

(*Concluded from page* 56)

system which could be applied hypothetically to a foundry having about $25,000 sales for a production of 82,000 pounds of miscellaneous castings. Main points of the system involved the following: Cost of doing business for one year; fixed overhead; operating overhead; metal for the year; melting for the year; molding; coremaking; finishing, etc. The departmental burden is applied on the basis of hours worked in each department, equipment installed and general investment. Mr. Wick believes that successful application of any system is based on the actual knowledge of overheads and operating expenses in each department.

C. I. Ritchie, Gray Iron Founders' society, Cleveland, brought up the question of appraising as against normalizing and was answered by Mr. Tour who said that normalizing is the true cost of production at a given volume of business and appraisal is the acquiring of a fair knowledge of investment, amortization, depreciation and interest on the investment. Witold Kosicki, J. T. Wing & Co., Detroit, referred to the problem of establishing a simple working system for the small foundry.

Discuss Molding Sand And Core Baking

BOTH molding sand and core sand were topics for papers presented at the sand research session. R. F. Harrington, Hunt-Spiller Mfg. Co., South Boston, Mass., presided at the meeting, attended by about 150.

A report on the correlation of the physical and chemical properties of clays with the durability of molding sands, presented by C. E. Schubert, University of Illinois, Urbana, Ill., gave several definite conclusions. This investigation was a comparison of the mold test, oven test and hydration and dehydration methods for determining durability.

Results of the experiments demonstrated that it is not possible to predict the life of molding sands by many of the three methods and that it is more economical to add bond after the sand has been used for a number of heats rather than to hold the strength constant by frequent additions of bond. It was also shown that the durability of a molding sand depends upon the physical and chemical properties of the mineral, or minerals, found in the bonding substance.

The speaker recommends that more samples of bonding substance be investigated so as to determine whether the results obtained in this study are applicable to a greater variety of molding sands.

Effects of different variables on the quality of baked cores were described by Harry W. Dietert, Harry W. Dietert Co., Detroit, in a paper on "A Study of Core Hardness," prepared by the speaker and Earl Woodliff, also of that company. A baking temperature of 350 degrees Fahr. was found to produce the highest tensile strength for the type of core oil used, though it was pointed out that different compositions would require different temperatures. Maximuum hardness and strength were obtained with a baking time of 1½ hours when a temperature of 350 degrees was used. While this length of time is not suggested as a fixed guide for all foundries, the tests showed that baking materially affects hardness.

It was stated that regardless of baking time, temperatures below 375 degrees produce the strongest cores and that neither time nor temperature influence permeability. Tensile strength increases at a faster rate as core oil is added, but permeability decreases. Sand grains of 70 to 140, preferably 100, produce maximum core hardness and strength. Hardness varies directly with the moisture content of the core sand mix. Maximum hardness is obtained when the cores are placed in the oven immediately after making, while maximum strength results from permitting the cores to stand in the core room for six hours before baking.

The report of the committee on sand research, presented by W. G. Reichert, Singer Mfg. Co., Elizabeth, N. J., stated that a new study of high temperature strength of molding sand for steel foundries recently has been started at Cornell university upon the recommendation of the committee. New forms for purchasing of foundry sand and two pamphlets covering A. F. A. tests also are being issued soon.

Williams & Wilson Ltd. recently have been appointed agents for N. A. Strand & Co., Chicago, manufacturers of flexible shafts and machines, and will cover the territory including Quebec, Ontario and the Maritime provinces. A stock of machines will be carried in both Montreal and Toronto.

Features X-Ray at Chicago Meeting

Use of x-ray in testing castings was the topic for discussion at the regular meeting of the Chicago chapter of the American Foundrymen's association, held at the Medinah club, May 10. Chairman L. J. Wise presided.

James R. Hewitt Jr., American Manganese Steel Co., Chicago Heights, Ill., described the experiences of his company in the use of this equipment. The x-ray is not employed as a production tool since it has not been found practicable to test each casting. Principal value of the x-ray has been found in its aid in regulating gating and heading practice and design of castings. Instances were cited by the speaker in which substantial improvement in yield resulted from changed practice dictated by x-ray findings.

Slides were shown illustrating practical application of the x-ray to casting inspection. Later discussion brought out the conclusion that while it would be difficult to induce casting buyers to assume the added cost of testing each casting purchased, that the x-ray is an invaluable aid in the improvement of foundry products.

A motion picture entitled "Foundry Dust Control" was presented before the technical session by the Liberty Mutual Insurance Co. This film showed various applications of dust control equipment and practices in foundries.

Nominees for offices of the Chicago chapter for the coming year, subject to election at the June meeting, were announced as follows: Chairman, H. W. Johnson, Greenlee Foundry Co.; vice chairman, L. H. Rudesill, Griffin Wheel Co.; secretary, W. G. Gude, THE FOUNDRY; treasurer, C. C. Kawin, Chas. C. Kawin Co.

Frank O'Connor, Walworth Co., Boston, addressed the nonferrous group of the Chicago chapter, speaking on the manufacture of nonferrous pressure castings of the foundry of his company. W. Romanoff, H. Cramer & Co., served as technical chairman. Mr. O'Connor discussed in detail the effect of the following various factors in causing the production of defective castings: Design of castings, pattern and core box; core making practice; molding methods, sand reconditioning, height of cope and angle of pouring; composition of metal, melting technique, etc.

Falling objects while being handled are chargeable with 5 per cent of all industrial cases, with 2 per cent of the time lost, and with 6 per cent of the compensation paid.

VIEWING FOUNDRY DEVELOPMENTS AT SHORT RANGE

CORROSION of magnesium alloys can be prevented by anodic treatment. The articles first are cleaned by making them anodes in a bath containing 4 ounces per gallon of codium carbonate and 4 ounces of trisodium phosphate per gallon at 195 degrees Fahr. Voltage is 4 to 6, and time of immersion 3 minutes. Then the cleaned work is made the anode in an anodizing bath composed of 10 per cent sodium dichromate and 2 to 5 per cent mono-sodium phosphate in water at 125 degrees Fahr. for 30 to 60 minutes. The cathode is a steel plate and the voltage used should be sufficient to produce a current density of 5 to 10 amperes per square foot.

♦ ♦ ♦

A nonferrous ingot manufacturer recommends that foundries having periodic sponginess on the cored side of bushing increase the pouring temperature slightly, and increase the addition of 15 *per cent phosphor-copper from* 2 *ounces per* 100 *pounds to* 6 *to* 10 *ounces per* 100 *pounds. The least amount necessary to eliminate the trouble is recommended.*

♦ ♦ ♦

Bright dipping of brass and copper wrought products is accomplished in a uniform and very satisfactory manner with a sulphuric acid-bichromate bath, and it should be satisfactory for cast products. The bath is composed of 5 per cent by volume of sulphuric acid and 3 per cent by weight of potassium bichromate, operated cold. Brass dipped in the solution has a bright surface without luster, and a pleasing golden-yellow color. Copper shows a good reddish surface. Potassium bichromate is a strong oxidizing agent and reacts readily with carbonaceous materials so does not contaminate the bath with greasy or oily substances, sooty matter or extraneous dirt. Aluminum containers or work baskets give good results for handling work through the bath.

♦ ♦ ♦

ULTRA-SOUND waves now are being employed to detect defects in metal parts up to 39 inches thick according to recent information. The application is based upon the ability of sound to pass through metal in the form of narrow bunches. If a crack, an airhole, or some other defect occurs in the path of the ultra-sound waves, the ray is deflected and does not pass through the defect.

♦ ♦ ♦

A new floor composition recently has been developed for places where acid resistance is required or extremely wet conditions prevail. It is comprised of diabase, quartz and a fluxing agent. It is used on old or new concrete floors to a thickness of 1-inch, and is said to be low in cost, quick setting, possess abrasion resistance, and easily applied.

♦ ♦ ♦

Cast iron which is claimed to be very fluid, highly resistant to corrosion, unaffected by sudden changes of temperature up to 1500 degrees Fahr., and though extremely hard when cast is not brittle, is described in a recent patent. The base material may be steel or wrought iron scrap, or cupola metal. The alloy is comprised of 30 per cent ferrochrome carbide, 2 per cent copper, ½-per cent lead, ½-per cent molybdenum, 1 per cent manganese oxide, and 66 per cent iron melted together. The alloy as cast is quite fluid, and if lightly worked (hammered) and brought up to a yellow heat it changes its crystalline structure to a fibrous one, and can be forged.

♦ ♦ ♦

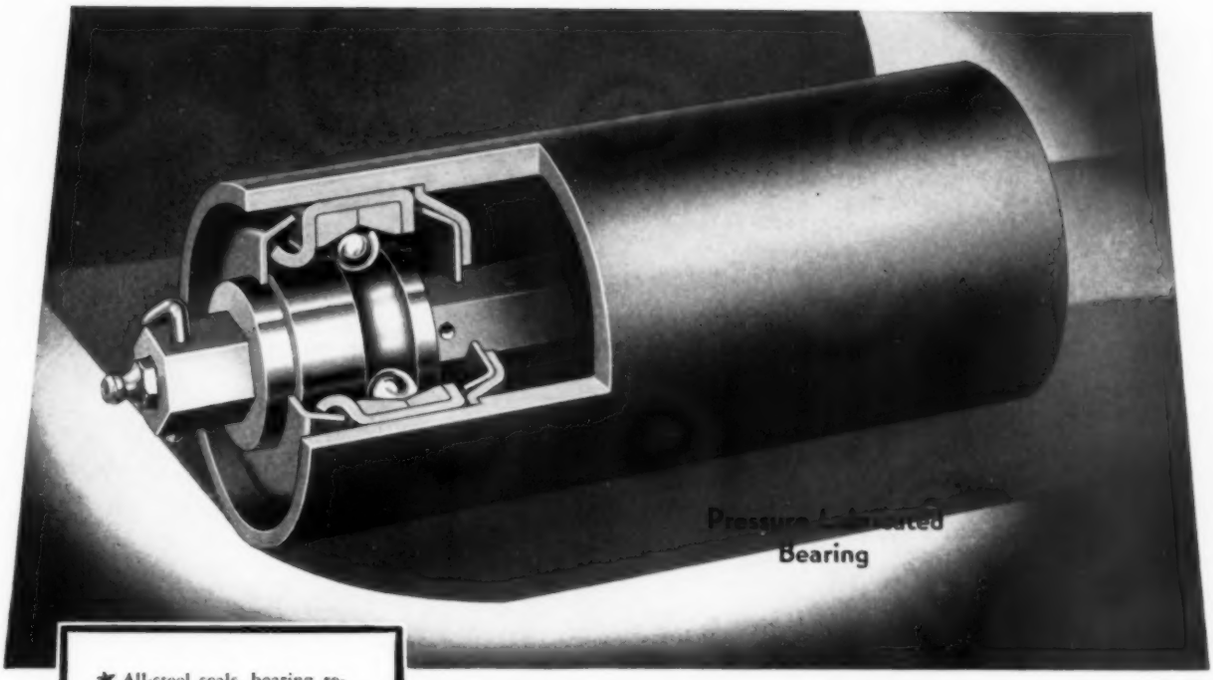
Suitable corrosion resisting steel casting compositions for the sulphite process of wood pulp manufacturer include 28 *per cent chromium,* 10 *per cent nickel, and* 3 *per cent molybdenum; and* 20 *per cent chromium,* 10 *per cent nickel, and* 3 *per cent molybdenum.*

♦ ♦ ♦

A new paint finish for application on metal, composition board, molded plastics and paper is said to resemble hammered brass copper or silver depending upon the colors and bronze powder used. The paint is intended for interior service only and is applied in two spraying operations of which the second calls for low-pressure spray guns. Twenty-two standard colors are available.

♦ ♦ ♦

IN MELTING 30 per cent cupro-nickel containing 0.5 per cent silicon, 1 per cent manganese, and 1 per cent iron, it is recommended that a slightly oxidizing flame be used, and as soon as the alloy has melted, it be oxidized with 1¼ ounces of nickel oxide or 3½ ounces of copper oxide per 100 pounds. Immediately on pulling the pot from the furnace 0.025 to 0.05 per cent magnesium is added to take care of sulphur pickup.



- ★ All-steel seals, bearing revolves as freely as a plain bearing because it has no felt washers.
- ★ Bearing in protected position—set back from end of roll.
- ★ The inner floating cup (patented) has a hexagon hole which snugly fits the shaft and prevents entry of grease into interior of roll.
- ★ The outer (dust) shield is fixed to the stationary inner race—does not touch any rotating part.
- ★ Molten metal dropping between shield and frame cannot "freeze" the roll.

Section of pouring line of Logan Roller Conveyor in a large foundry. Moulds move on down to shake-out.

ALL-STEEL SEALS

for complete protection, long life, least friction

AND now a bearing that's protected, *without efficiency loss.* For foundry service—not only must the bearing be good, but it should be adequately protected by means which do not counteract the advantages of anti-friction bearings.

The all-steel seals of Logan Pressure-Lubricated bearings give complete protection with minimum friction loss. The life of the sealing members is indefinite; there are no felt washers to harden, or shrink, or wear, and require replacement.

The Logan Pressure-Lubricated construction is as simple as it is effective. For complete details write, on your letterhead, for new Logan Foundry Conveyor Bulletin.

LOGAN CO., Incorporated
580 Buchanan St., Louisville, Ky.

HELP YOU GET OUT THE WORK

Logan Conveyors

LOUISVILLE

And the green grass grew all round

BILL came around the other night to find me sitting on the front steps wearily dragging a few puffs from an old clay pipe kept for specially depressed periods and attempting to get a little rest after a particularly fatiguing session with a dull lawn mower. I don't know what kind of miraculous soil is in this lawn, but the grass seems to spring up knee deep almost over night. Despite veiled hints and sly innueundos I postpone the job from day to day with the result that when I finally am driven into a corner the stuff is ready for a scythe or a McCormick reaper. Taking a leaf from one of the sterling romances of the late Mr. Fennimore Cooper, on more than one occasion I have contemplated the advisability of setting fire to the prairie. From the manner in which this sensible and sanitary plan was received by the family I am afraid I shall have to pigeon hole it under the head of unfinished business. Also from the manner in which the cursed stuff clogs the knives on the lawn mower, I doubt if anything less than a flood of lava from Mount Vesuvius would burn it.

Bill showed little sympathy. He professed to believe that if I were to run the mower over the lawn once a week I should have no trouble.

"The trouble with you and a lot of other people," he said, "is that you are only half awake. You keep hoping in some miraculous manner that some other person will do what you should do yourself. Reminds me of a story I heard at a dinner I attended in Detroit several years ago. Of course you might say who cares and what's the difference where you heard it. The story probably is a hardy perennial. One of those things you bump into at every public gathering.

"Under ordinary conditions your no doubt well meant, but nevertheless snooty objections would be justified. In this instance you simply are a dog in the manger barking up the wrong tree.

"In the first place I am telling the story and I claim the inalienable right guaranteed under the Constitution to tell the story any way I please. In the second place I am willing to wager any reasonable sum, say up to two bits, same to be devoted to the funds of any charity you care to mention, that you never heard the story. How do I know? Because if you had heard the story you would have repeated it to me at least half a dozen times and in each instance brazenly claim that you were the hero. In the third place although I circulate around quite a bit I never heard the story either before or since. Even the radio boys seem to have missed it. If that is not a record of some kind, I miss my guess by a long sea mile.

"The speaker of the evening was

Still life study, The Chestnut Vendor

an alderman or a judge or something in one of the local courts. They all look alike after a few months at the public trough. He had selected *Citizenship* as the theme for his discourse. That is a fairly safe subject for discussion, even by a judge who has to come up for reelection every so often. As a member in good standing, all dues fully paid up in Local 46 Itinerant and Occasional Public Speaker's National Union of North America, hereafter and if necessary referred to as I. & O. P. S. N. U. of N. A., I am here to say the honorable gentleman turned off a very nice job indeed, quite a credit to the craft and to the I. & P. S. etc.

"Illustrating the point that altogether too many citizens, either through natural dumbness or sheer mental inertia, are not worthy of the sacred trust confided in them by a fond and paternal government, he told the story of Thomas Aquinas O'Shannon, known to his intimates in newspaper circles as Turnip. Yeah, Thos. kind of bulged above the water line, although water for internal use and in so far as he was concerned practically was an unknown substance. In common with many literary lights," here he gave me the eye, "In common with lots of literary gents he had a powerful chest, worn low and—well, we can skip that feature since it has no direct bearing on the story. Merely a light dab of local color.

"Mr. O'Shannon—or, since we are all friends here together, Turnip—was a newspaper reporter with a more than local reputation as a colorful recorder of events in the field of sport. In fact he is credited with having coined many of the slangy—and to the ordinary reader—unintelligible terms which sport writers seem to consider necessary in describing various games and con-

(*Continued on page* 65)

(*Continued from page* 62)

tests of skill and endurance. Have you ever read a newspaper story of a baseball game in which the ball was called a ball? No. Neither have I. The writing boys avoid that plain simple word as they would a rattlesnake or the simpler rules of spelling and English composition. In a pathetic attempt to inject wit and humor into a subject that has been worn threadbare through constant repetition day after day for six months of the year, the ball becomes a pill, a pellet, a globe, an apple, an onion, a tomato, a projectile or a missile. Invariably this last term is spelled either missal or missel. No doubt deliberately to heighten the humorous intent.

"However, all this is leading us too far from the home plate. What I started to say is that while Turnip had a more than local reputation as a sports writer, he enjoyed even a greater reputation as one who dilly-dallied with the demon rum. To prevent any misunderstanding, perhaps I should say that our hero flourished during the prohibition era when the importation, manufacture, sale and drinking of alcoholic liquor was forbidden in this country. In a kind of a roundabout way, if you take my meaning, dearie, that explains why Turnip was in a saturated condition most of the time. In the quaint and sporting language of the period, he was pie-eyed, pickled, crocked, soused, lit or just plain paralyzed most of the time.

"I suppose," said Bill, pausing momentarily, "I suppose if I was telling this story to members of the younger generation, a generation which has grown up since this demon, this menace to health and morals was banished from our shores, I should explain that these various terms merely are sinamens—What's that? Synonyms—Oh! Alright, have it your own way—synonyms for the old fashioned expression dead drunk, or as soused as Davy's sow."

"I would not lose any sleep over the situation," I said. "Members of the younger generation are wonderfully quick that way. Even without any long, labored explanation they probably would know what you meant. Most of them are far enough advanced to read the funnies and patronize the movies. You know one of the more daring movies occasionally shows a scene where the presence of liquor may be detected by the naked eye."

"Detected, hey? Go cut yourself a twig of laurel for the champion understatement of the week. Let's get back to Turnip before he fades out of the picture or is flushed down a manhole. During his brief periods of sobriety he had worked for every paper in the city. He had been hired and fired times without number and finally had reached the stage where he could not get a job from any editor in the city.

"He made the rounds one day, but was turned down flat by every prospective employer. Late in the afternoon he rambled down Jefferson avenuue to visit a friend who kept a stone cutting shop. One of these places where they whack out monuments, tombstones or markers for cemeteries. Monuments & Artistic Stone Work Done Here. Angus McGrippem, Prop.

" 'Turnip, my boy,' says brave Angus, 'You're just the lad I want to see. I have a job here that is too much for me.'

" 'Sez you,' Turnip shrugged his shoulders. 'You're one up on me. I have no job. And what is more to the point, my jolly old stone chiseler, I don't know where to get one.'

" 'Don't worry," said McGrippem, piously, 'The Lord will provide. In the meantime I want a little help. Listen. An ancient maiden lady named Mollie McQuaid died recently and left a pot of money. Maybe two pots. Anyway, she left plenty. In her will she specified that $200, no more, no less, be set aside for a modest marker in the cemetery. One of the executors called me on the phone and gave me the order. When I asked him what kind of an inscription he wanted on the stone, he told me to suit myself and then promptly hung up. Can you tie that?

" 'Now, you know me, Turnip ol' kid. As handy a lad as ever laid mallet against a chisel. Gimme the words and I'll knock 'em out any way you like, raised or sunken, intaglio or basrelief, gothic or old English script. Conventional design, leafage or scrolls are all in the day's work. However, when it comes to inventing the words, why, I just ain't there, that's all. Here's where you come in. Writing is your trade same as stone cutting is mine. Knock me out a little verse or something to go on this here now stone.'

" 'Sorry, Angus,' said Turnip. 'Terribly sorry, ol' man, but I don't appear able to hit the old apple on the nose at the moment. Have you, by any chance a small drop of the elixer of life about the place? Might clear up the fog.'

"Fortunately Angus had a drop in the cupboard where he kept his other hat. He hastily explained that he always kept a vial on hand in cases of snake bites, chips in the eye, welts, blisters, stone bruises or other hazards of the industry. Washed the dust out of the pipes and prevent silicosis. He also had found it to be an excellent gargle and while the city of Detroit enjoyed an excellent reputation for the purity of its drinking water, still you never can tell. Prevention is better than cure. Ordinary prudence suggested the admixture of a small quantity of the elixer to any water destined for internal use.

The driver oils all the gears before he throws her into high

"Turnip seized the bottle eagerly, bowed courteously in the general direction of Mr. McGrippem, hastily recited the magic formula *happy days*, then upended the bottle and allowed about half the contents to gurgle down the throttle. He wiped the top of the botttle with the flat of his hand, replaced the cork and sighed a sigh of content.

" 'O.K., Ang,' says he. 'The old engine once more is hitting on all six. Would you mind going over that little spiel of yours again? I did not quite connect with your curves the first time. Too much smoke on the old pill or something. All set now. Batter up!'

"Angus repeated the story.

" 'There y'are,' said he. 'You can do a little thing like that in a minute. You're a writing guy—'

'One of the best in the business,'

Turnip admitted modestly. 'Acclaimed alike by press and public from the rock bound coast of Maine to where the shimmering waves of the Pacific kiss the silver sands of California—'

" 'Less of it,' said Augus. 'Less of it. Kiss the baloney good bye and get your feet back on the ground. How about a verse for this here now McQuaid dame? If you don't mind I'd like to have it today'.

" 'Certainly,' said Turnip. 'Certainly. Just a moment 'till I absorb what little inspiration is left in the bottle. No use leaving it lying around. Might turn sour or something if a thunder storm happened to come up. I always say no use taking shances—I mean chances—well, here she goes down the rat hole and the same and many of 'em to all managing editors!'

"He fished a stubby pencil out of his vest pocket and proceeded to compose the desired epic on a piece of shingle. He moistened the pencil many times and occasionally rubbed out a word with a grimy thumb. Finally with the satisfied grin of your true artist when he has completed a particularly difficult piece of work he handed the shingle to Augus.

" 'Pretty neat, if you ask me,' said he. 'Final edition. Complete box score.'

Here lies the body of Mollie McQuaid.
For her, death had no terrors.
She lived and died a virgin maid
No hits. No runs. No errors.

Cast Iron Forum Features Meeting Of Porcelain Enamel Institute

APPROXIMATELY 250 members and guests attended the first annual forum of the Porcelain Enamel institute held at the University of Illinois, Urbana, Ill., May 5, 6 and 7. Of particular interest to foundrymen was the session on cast iron held on Friday, May 7. H. D. Wolfram, Porcelain Enamel & Mfg. Co., Baltimore, Md., presided as chairman, and called on M. L. Carl, Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., to present his paper entitled, "Foundry Practice."

Close Co-operation Required

Mr. Carl pointed out that much of the trouble encountered in enameling cast iron can be eliminated by close co-operation between enamelers, founders, and patternmakers. Troubles may be divided into three general classifications of iron composition, casting surface and casting design, but that does not mean that difficulty is caused by any single phase—rather it usually is a combination of two or more. The fact that a number of iron compositions are being enameled successfully indicates that there is no one superior type. However, with each, careful attention must be given to patterns, molding sand control, molding, melting, etc.

Blistering probably is responsible for most difficulties, and it may be due to numerous conditions including: Iron and scrap used in cupola charges, melting practice, handling of iron from cupola to molds, condition of molding sand, kind and amount of facing used on molds, and design of casting. Castings for enameling should be of uniform soundness throughout with the least surface chill possible containing the minimum reasonable percentage of combined carbon. A suitable range of elements for light castings will be: Silicon, 2.45 to 2.55 per cent; manganese, 0.40 to 0.50 per cent; total carbon, 3.35 to 3.50 per cent; sulphur, 0.06 to 0.10 per cent; phosphorus, 0.75 to 0.85 per cent, and combined carbon, 0.25 to 0.40 per cent.

In the discussion M. E. Manson, Chicago Vitreous Enamel Products Co., Cicero, Ill., expressed the opinion that too low a coke bed in the cupola was responsible for producing cast iron which blistered in enameling. Minimum height of the bed should be 42 to 54 inches above the tuyeres. Also, it is just as necessary to maintain the proper coke bed as it is to start with the proper bed. Size of coke charged also influences the amount of combined carbon (responsible for blistering), and the coke size should be maintained uniformly throughout the heat. If wet coke is charged, it is better to charge by volume than by weight to prevent getting too little coke.

Mr. Manson spoke of the general prohibition against use of facings in molds as that increased the difficulty in obtaining good enameling surfaces on the castings. Facings are now available which may be used. Speaking of tests made in his firm's laboratory on enameling sections of pig iron to determine effect of inherent quality, he said that it still remains an open question. He mentioned that studies of the coefficients of expansion of six cast irons indicated that it was not necessary to vary the enameling practice because of expansion. However, varying cross sections in castings, did require special practice.

R. B. Schaal, Ferro Enamel Corp., Cleveland, emphasized importance of varying the coke charge according to the percentage of carbon, and the necessity of keeping the coke bed high. He believed that iron melted at too high temperatures was worse for enameling than if melted at too low temperatures. Crowding the cupola also produced poor enameling iron. Cupolas should not be operated above 80 per cent of their capacity. Since much of the research in cast iron has been to produce special characteristics not essential for enameling purposes, it is advisable to separate production of general castings and those for enameling. The best iron for enameling is of the type formerly known as ornamental iron. In the old days cupolas were not forced, and a high phosphorus content produced an iron of high fluidity at a lower melting point.

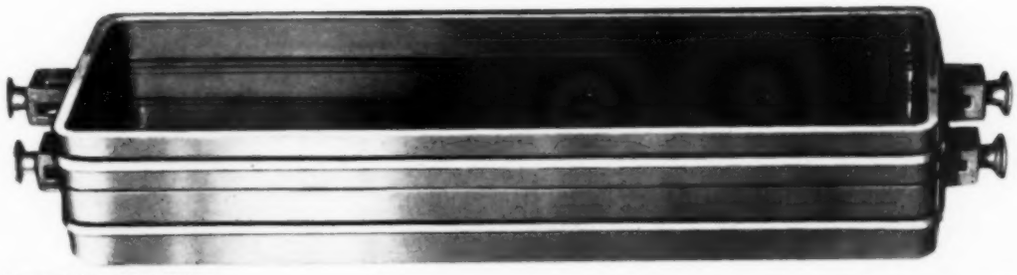
Emerson Poste, Poste Testing Laboratories, Chattanooga, Tenn., deplored the widespread lack of cooperation between foundry and enameling departments, and pointed out the necessity for harmony in working for a quality, finished product. The solution is a responsibility of management. Other points raised in discussion were: Keep scrap free from alloys, particularly chromium, molybdenum and vanadium. Use of No. 1 stoveplate or No. 1 machine scrap was recommended. Do not use scrap of large cross section or over 100 pounds in weight. Chemical composition of iron may differ with cross section, therefore the test bar may not represent enameling properties. Open grain surfaces are more likely to produce gases during enameling which may cause trouble.

Employ High Coke Ratio

The second paper by E. C. Porst, George D. Roper Corp., Rockford, Ill., discussed the processing of leadless cast iron enamels, and included reference to some foundry phases. The firm uses a cupola lined to 66 inches, and the total iron charge varies from 50,000 to 70,000 pounds per heat. Of that charge 500 pounds of coke and 80 pounds of limestone per ton of iron are used. Coke bed is located 38 inches above the tuyeres. The latter are in one continuous row and compose about 30 per cent of the hearth area.

Pig iron containing 2.50 per cent silicon, 0.65 per cent manganese, and 0.20 per cent phosphorus is used with foundry returns, purchased No. 1 machinery scrap and a small amount of sheet steel scrap. The final analysis shows 2.25 per cent silicon, 0.60 per cent manganese, 0.20 per cent phosphorus, and 3.25

(*Concluded on page* 68)



Your foundry flask requirements—no matter how "different" or "special"—can be supplied to your satisfaction by Sterling... Size ranges from the small bench type to the largest the transportation companies can haul . . . for hand or machine molding . . . for green sand or dry . . . for jobbing or production foundries. If you have a "tough" flask job or an easy one, send us your specifications . . . .

Patent No. 1974292

STERLING WHEELBARROW CO.

7100 WEST WALKER STREET

MILWAUKEE • WISCONSIN, U.S.A.

(*Concluded from page* 66)

per cent total carbon. Slag hole of the cupola is located 3 inches above the bottom, and left open. Iron is tapped into a bull ladle which is carried to the proper floor and transferred to hand ladles with skimmers.

Sand control is maintained on heaps for moisture, permeability and green compression strength. For molding stove legs 10 per cent Commodore and 90 per cent Albany sand is used. Moisture is 7 to 8 per cent, permeability 55 and green strength 4.4 pounds per square inch. For grates 40 per cent Albany and 60 per cent Commodore sand is used which shows 7.5 to 8.5 per cent moisture, 33 permeability and 6 pounds per square inch green compression strength. A small percentage of core sand is mixed with all Commodore sand for molding burners. That sand shows 8 to 8.5 per cent moisture, permeability 30 and green strength 6.6 pounds per square inch.

Legs, burners, etc. which can withstand tumbling are blasted in a tumbler blast machine for 3 runs of 20 minutes each using 100 pounds per square inch air pressure. Parts thus treated are sufficiently clean for black enamel. However, for white or ivory enamel the parts are blasted further on the edges by hand. Stove fronts and grates are blasted with 40 to 50 pounds per square inch air pressure to prevent warping. The nozzle is held 3 feet from the work. For parts not easily warped the nozzle is held about 2 feet away.

Discussion of Mr. Prost's paper included reference to the effect of size and location of gates being important in reducing sand holes and in producing good enameling castings. High sandblast pressure often causes warping of stove fronts and flat parts. In one casting which warped, increasing the sulphur content overcame the trouble. Sandblast pressures suitable for one type of iron may not be satisfactory for another. This feature may be determined by experiment.

British Iron and Steel Institute Studies Making of Ingot Molds

By VINCENT DELPORT

ANNUAL meeting of the Iron and Steel Institute, which was held in London, April 29 and 30, was marked by the attendance of a relatively large number of foreign members, particularly from Germany. Sir Harold Carpenter presided at the beginning of the opening meeting and extended a warm welcome to the visitors. He then inducted the newly-elected president, Alfred Hutchinson, chairman of the Skinningrove Iron Co., Ltd., Saltburn-by-the-Sea, Yorkshire, who occupied the chair.

Welcome Foreign Visitors

In taking the chair, Mr. Hutchinson, in turn, welcomed the overseas visitors from Belgium, France, Germany, Luxemburg, Spain and the United States. He mentioned that an invitation had been received from the American Iron & Steel institute and from the American Association of Mining & Metallurgical Engineers to hold a meeting in the United States in 1938, and he stated that the invitation had been accepted by the British institute.

K. Headlam-Morley, secretary of the institute, announced that the Honorable Roland Kitson, of London, had been elected an honorary vice-president, and that Prof. W. A. Bone, of the Imperial College of Science and Technology, London, had been elected an honorary member. Three vice-presidents whose terms of office had expired were reelected, namely: C. E. Lloyd, Netherton Iron Works, Dudley, Staffordshire; Dr. W. H. Hatfield, director of the Brown-Firth Research Laboratories, Sheffield; Sir William Larke, director of the British Iron & Steel federation. The president then presented the Bessemer gold medal to Colonel N. T. Belaiew, Paris, and to Aloyse Meyer, managing director of "Arbed", Luxemburg.

Following the presidential address, the seventh report on the heterogeneity of steel ingots was presented by Dr. W. H. Hatfield, chairman of the committee. This report is divided into seven sections, including: A study of rimming steel; inclusions in a series of bath samples from an eletric furnace; oxygen determinations on a series of bath samples from an electric furnace; determination of oxygen in steel; the results of further experiments on gases in iron and steel, and their effect on the solidification of ingots; the first report of the Ingot Molds sub-Committee; pyrometry.

In the discussion that followed, all expressed admiration for the work of the committee. Dr. E. Houdremont, of Friedrich Krupp, Essen, Germany, stated that interesting investigations also were being made at the laboratories of the Krupp company at Essen, particularly in regard to the presence of oxygen and sulphur in steel. He also pointed out that it should be possible to increase the life of ingot molds by from 50 to 70 per cent by controlling the carbon in the pig iron from which the molds are made, by proper control of the cupola and by more complete control in the steelworks in the use of the molds.

Decide Life of Molds

Commenting upon the report of the ingot molds sub-committee, which had been presented by R. H. Myers, of the Industrial Research council of the British Iron & Steel federation, Dr. Hatfield said that a certain standard of life should be set for ingot molds used for rimming steel or alloy steels respectively for the purpose of stating when such molds should be scrapped after having given a useful life.

Another speaker pointed out that it is often the case that two molds identical in their composition and specification, but coming from different manufacturers, have widely different lives: he suggested that this is largely due to molding technique, and, furthermore, that everything else being equal, the life of a mold depends upon the temperature at which it is used.

Another speaker, referring to that part of the report where it is stated that crazing is primarily due to growth, expressed the opinion that crazing is due mainly to variations of temperature in the mold. Referring to the occurrence of cavities, he said that while it is true that thermal stresses may cause cracking in cast iron molds, they would cause distortion in steel molds.

J. E. Hurst, Bradley & Foster, Ltd., Darlaston, Staffordshire, stated that failures in cast iron ingot molds may be attributed to stresses, and pointed out that the mechanical properties of the cast iron from which the molds are made have a considerable bearing on that point. He mentioned that for some years he had measured mechanical properties of cast iron, including its elastic characteristics, and he had found that for individual samples of the same iron the properties varied considerably in time, and this may have a bearing on the behavior of molds in service. He had also found variations in individual castings, such as cylinder liners, where the properties vary in different sections of the casting.

The meeting on the morning of Friday, April 30, opened with the presentation of the Carnegie silver medal, which was awarded to Hans Esser, Aachen, Germany, for his paper on the allotropy of iron, published in the Carnegie Scholarship Memoirs of 1936. A number of Andrew Carnegie research scholarships for 1937 were also announced.

ADVERTISING PAGES REMOVED

Automotive Cast Irons Progress

(*Continued from page 23*)

types are usually poured from this grade of iron: Valve stem guides, oil pump bodies, water pump impellers, intake manifolds, transmission case covers, etc.

There are at least three physical characteristics that must be regulated carefully in piston rings, namely, hardness, strength and resilience. Compositions of iron for the larger sizes of rings may consist of anything from small parts iron to the highest grade of cylinder iron. Small rings require, probably, the softest grade of gray iron that it is possible to produce, although the requirements in the finished castings are just as rigid as for those in any other type of casting.

Consider Cupola Dimensions

In the melting of iron for small piston rings, special consideration must be given in the case of cupola operation to such matters as cupola dimensions. Here, the capacity of the hearth and the period of time in which metal is subjected to contact with the white-hot coke in the bed, and the amount and composition of the slag, etc., as well as the details of cupola operation and grade of coke, all produce appreciable changes in the composition and chilling characteristics of the iron.

Regulation of the amount of combined carbon is of prime importance. There are two effective means by which this constituent may be controlled, namely, by the per cent of silicon held in the composition, and by the per cent of foundry returns or cast iron scrap carried in the furnace charge. The higher the silicon and the lower the amount of foundry returns, the lower will be the combined carbon.

The chill depth required for piston ring iron depends on the size of the ring and the hardness specified. For very small rings, the depth of chill should be negligible. The practice of holding the chill as low as possible in small piston ring work, as just stated, is due to the fact that one of the most prevalent sources of trouble in the production of piston rings is chilled iron, and for that reason, piston ring foundries have taken extra precautions in the way of equipment and practice to overcome the difficulty.

It is well known that the amount of moisture in the cupola air blast has an influence on the chilling characteristics of the iron, which is quite appreciable when the humidity is high on damp warm days. Even in foundries where much larger work is cast, equipment is provided for the purpose of determining the weight of water contained in one cubic foot of air so that changes may be made in the cupola charge and coke ratio, and thereby anticipate and counteract the effect of excessive moisture in the blast. The piston ring foundry has gone one step further in the elimination of this source of trouble by dehydrating the blast. Numerous installations for this purpose are now in operation in piston ring foundries.

To preserve a more permanent resilience in piston rings a certain degree of heat resisting properties should be incorporated in the iron. The use of alloys for this purpose is to be encouraged, the kind and amount depending upon the size of the ring and the severity of the service conditions. Chromium in varying amounts is recommended for heat resistance and wear, molybdenum for resilience and wear, and nickel for chill reduction.

More Alloys Used

Iron for heat and growth resistance as found in automobile, truck and bus service is similar to cylinder iron, although the total carbon and silicon are usually held somewhat lower, and heavier additions of alloys are used. The carbon in this iron usually is held within limits of 2.80 to 3.15 per cent, and silicon to 1.75 to 2.00 per cent. Combinations of chromium, nickel and molybdenum are used as alloying elements.

Compositions similar to the following often are employed: (1) Chromium, 0.25 per cent, molybdenum, 0.75 to 1.25 per cent; or (2) Chromium, 0.50 to 1.00 per cent, nickel, 0.75 to 1.50 per cent. The castings often are difficult to machine and usually are annealed at temperatures of 1400 to 1600 degrees Fahr. The hardness after annealing is held to 200 to 215 brinell.

For exceptionally severe conditions, special compositions containing much higher percentages of chromium, nickel and copper are used. One of these compositions contains about 14 per cent nickel, 5 per cent copper and 2 per cent chromium, with carbon 2.60 to 3.00 per cent and silicon 1.25 to 2.00 per cent. This iron is melted in the cupola with special charges where the higher carbon is acceptable, and does not necessarily have to be annealed. For the lower carbon compositions electric or other types of furnaces are used. When annealing is necessary, temperatures of 1400 to 1650 degrees Fahr. usually are sufficient for these light castings.

A second composition contains about 24 per cent chromium and 1.50 per cent carbon. As cast, this iron has a hardness of 400 brinell. It must be annealed at a temperature of 1700 degrees Fahr. for eight hours and cooled slowly in the furnace down to 1100 degrees Fahr. After annealing, the hardness is reduced to 280 to 300 brinell. This composition cannot be made in the cupola on account of the low carbon requirement. Exhaust manifolds, cylinder blocks and liners, truck and bus brake drums, valve seat inserts, diesel engine parts, etc., often are made from compositions similar to those mentioned.

High Percentage of Steel Scrap

High test gray iron, as the name implies, is a gray iron possessing greater strength and impact values than cylinder iron. The carbon is held lower and the silicon is generally higher than in cylinder iron. The composition covers quite a wide range, 2.00 to 3.00 per cent carbon; 2.25 to 3.00 per cent silicon, sulphur and phosphorus as low as possible, and 0.75 to 1.00 per cent manganese. Alloys often are used when the highest strength and impact values are required. The cupola usually is used when carbon ranges of 2.85 to 3.00 per cent are specified, with high percentages of steel scrap in the cupola charges.

Nickel in amounts of 0.75 to 1.50 per cent and molybdenum from 0.50 to 1.00 per cent often are added, and chromium in smaller amounts from 0.10 to 0.20 per cent. The tensile strengths of these irons vary from 50,000 to 100,000 pounds per square inch, depending on the composition, alloys added, and raw materials used, as well as the skill and knowledge involved in the melting practice. Impact values are often more than double that of cylinder iron. This iron has a maximum modulus of elasticity of 22,000,000 pounds per square inch or two-thirds that of steel.

It has a higher damping capacity than steel. Its elastic limit in both tensile and torsional stresses is very high and compares favorably with those of 1045 steel. One notable feature of this iron is the uniformly fine fracture and hardness throughout large cross sections. So far this iron has not found wide use in the automotive field, although it is being used in crankshafts for trucks and diesel engines, and in large dies. Crankshafts weighing 1000 pounds and more are being produced on a production basis and are proving very satisfactory.

In one foundry, cast iron crankshafts are being made from high test electric furnace gray iron in which the cold charging method is used. Great care is used in the selection of pig iron and other raw

materials. In this particular iron, the sulphur and phosphorus are held below 0.06 per cent. A strict schedule is observed in all details of the melting practice, in the additions of alloys, current and voltage factors, and tapping temperatures. The brinell hardness is confined to limits of 260 to 290. The composition is adjusted for the various sizes of shafts to be poured. This iron requires no heat treatment.

High-silicon, carbon cast steel has come into wide use during the past few years, and no doubt will continue to increase in favor. It has many of the physical characteristics of spring steel, and in the molten state has to be handled in about the same manner. As cast, it is hard and brittle and must be annealed for a period of from 4 to 8 hours. There is no set standard as to the composition and heat treatment of this metal, and numerous modifications may be followed with corresponding variations in physical properties.

Metal Is Heat Treated

The following composition has been used extensively: Carbon, 1.20 to 1.45 per cent; silicon, 0.80 to 1.30 per cent; manganese, 0.60 to 0.75 per cent; phosphorus, below 0.10 per cent; sulphur, below 0.07 per cent; molybdenum 0.20 per cent. The heat treatment consists of heating to a temperature of 1575 to 1600 degrees Fahr. and holding at this temperature for a period of four hours, air qunching to below 1400 degrees, reheating to above 1400 degrees and cooling at not more than 75 degrees per hour down to 1100 degrees Fahr.

This iron has a tensile strength of 120,000 to 130,000 pounds per square inch, Young's modulus of 30,000,000 to 33,000,000 pounds per square inch, elongation of 6 to 8 per cent, and a hardness of 225 to 245 brinell. The structural constituents are spheroidal pearlite and a small amount of pro-eutectoid cementite. With certain modifications in composition and heat treatment, the pro-eutectoid cementite may be disintegrated with the formation of graphite.

This iron cannot be melted in the cupola alone on account of the low carbon requirement. One interesting set up for the melting of this metal consists of a combination of cupola, converter and electric furnace. By means of this arrangement, continuous melting is attained with a minimum first cost in melting equipment.

The iron first is melted in the cupola as gray iron of suitable composition. A weighed amount of this iron is tapped from the cupola and introduced into the converter. During the time consumed in blowing, deoxidation and additions of alloys, another tap of gray iron from the cupola is weighed into a mixing ladle. The converter heat is finished and added to a mixer with the cupola metal. The blow in the converter has raised the temperature of that metal to about 3000 degrees Fahr. and the combination of the converter and cupola metal has been so balanced that the composition is almost identical to that of the finishing composition.

The whole then is added to the electric furnace for superheating. The electric furnace is kept well filled at all times and as the metal added to the electric furnace from the mixing ladle is practically the same in composition as that in the electric furnace, no delay is caused in the continuous pouring of metal to the molding conveyors. This operation requires close metallurgical control. Tapping temperatures are from 2900 to 3000 degrees Fahr.

This iron and modified compositions including 1.00 to 2.00 per cent copper, are used in crankshafts, brake drums, pistons, etc. It is likely that the use of this metal will be extended to other automotive parts.

Cast Iron for Camshafts

The cast iron camshaft made its appearance a few years back, and is used in large numbers by many in the automobile industry. There are two or more compositions in use, all consisting of a normal gray iron base. Just one composition will be discussed here, that of the alloyed camshaft of the following composition: Total carbon, 3.15 to 3.35 per cent; silicon, 2.15 to 2.30 per cent; chromium, 0.80 to 1.00 per cent; molybdenum, 0.40 to 0.50 per cent; nickel, 0.25 to 0.35 per cent; phosphorus, 0.20 per cent maximum, and sulphur, 0.12 per cent maximum.

The hardness of the shaft must be held within the limits of 250 to 290 brinell in order to resist wear and yet be machinable. The structure is pearlitic with appreciable amounts of the double carbide of iron and chromium. The cams are hardened by either the use of chills in the mold or by localized heat treating. The heat treating procedure consists of rapidly heating the cams to a temperature of 1750 to 1850 degrees Fahr. and air quenching.

Dissipation of heat from the cam to the body of the shaft is sufficiently rapid to harden the cam. The cams are cast to a very close limit in size, and require a minimum amount of machining and grinding. The melting practice followed is known as electric furnace duplexing, in which the alloyed base metal is melted in a cupola and finished in the electric furnace.

The process is continuous, and a very close chemical and physical control is practiced. Chill test and brinell hardness test samples are taken at frequent intervals as well as spectroscopic and chemical tests. This iron has a tensile strength of over 50,000 pounds per square inch, and has been found to give satisfactory service.

Catalog Presents Foundry Data

Frederic B. Stevens Inc., Third and Larned streets, Detroit, recently has published a new catalog covering its entire line of foundry facings, supplies, equipment and fire brick, buffing compositions and electroplating supplies and equipment. This catalog contains 565 pages of 7½ x 10¾ inches and is the most complete of the 21 catalogs which have been published during the 52 years that the concern has been in business. As pointed out by W. J. Cluff, president of the organization, the publication in addition to being a catalog of products, is an encyclopedia of general information relating to foundry practice and the operation of polishing and cleaning metal.

Following the introduction, the text deals with foundry facings and foundry materials; cupola room requirements; foundry equipment and supplies; brass foundry equipment and supplies; cleaning room equipment and supplies; core room equipment and supplies; pattern shop equipment and supplies; miscellaneous-tables, fire brick, buffing compositions, polishing room supplies and equipment; electroplating supplies and equipment. An extensive index provides a ready reference for all items listed and will be appreciated by those who have occasion to consult the catalog.

The catalog is exceptionally well illustrated with photographic reproductions showing the company's facilities at Detroit and distributors' plants at Buffalo, Indianapolis, New Haven, Conn. and Windsor, Ont., action photographs in foundries and photographs and drawings of different types of equipment and supplies. In addition, a number of pen and ink sketches add interest to the first section of the publication.

Harnischfeger Corp., Milwaukee, is establishing a new department to manufacture and distribute weld rods. The old Hercules steel foundry acquired in 1923, but not operated in recent years, is being reconditioned and re-equipped for purposes of the weld rod department, with J. P. Morrissey as sales manager.

KNEE-DEEP in *Profits!*

IN THE FOUNDRY...sparks are profits! These tough, high-speed U. S. ROYALITE WHEELS are snagging 200,000,000 chips a minute . . . eating up dead metal...taking a big bite out of operating expense . . . cutting down costly time! High-speed U. S. ROYALITE GRINDING WHEELS are strong, fast, and safe! They run cool and last long... that's why they give you—

SERVICE BEYOND PRICE AND SPECIFICATIONS

UNITED STATES RUBBER COMPANY · US · TRADE MARK

ROYALITE GRINDING WHEELS

United States Rubber Company

United States Rubber Products, Inc., New York, N. Y.

Ancient Chinese Castings

(*Concluded from page* 27)

It is interesting to notice that no iron casting bearing a date earlier than 500 A.D. (except one which I consider spurious) has yet come to my notice. One would suspect that the custom of placing an inscription on a relatively small casting came into use about that time, were it not that inscribed bronze castings of an earlier date are not rare. Also a passage in the Tso Chuan, which modern scholars consider to have been written not later than the third century, B.C., states that two officials of the state of Ts'in requisitioned 650 pounds of iron to cast a tripod on which the criminal code was inscribed. This is the earliest reference to cast iron to be found in Chinese literature, yet it refers to a casting with a text upon it. The oldest iron casting still in existence is a stove, now on exhibition in the Field Museum, Chicago. This bears the inscription I Hou Wang, "may it serve the King," but no precise date. Berthold Laufer, who secured it for the museum, considers that it can be dated (from the grave in which it was found), as not later than 220 A.D., and perhaps nearly 400 years earlier than that.

Effect of Buddhism

The most probable explanation why iron castings earlier than 500 A.D. are rare in China, although there is evidence which will be given later, that cast iron was in use for a thousand years before that, is that that period was marked by a flare-up of Buddhism. Introduced in China from India many centuries earlier, its effect on Chinese art is first seen in a notable degree during the Northern Wei dynasty (386-534 A.D.). During the period 502-556 A.D. communication with India by sea through the Straits of Malacca was opened, bringing in new ideas in art, among them winged lions, which were first executed in stone and later cast. The large casting previously referred to, though devoid of wings, doubtless owes its suggestion to this wave of influence from India.

As already suggested, it seems probable that the iron castings made in China prior to 500 A.D. were mostly objects of practical utility, and that when they became old-fashioned or marred they were remelted, as has happened with most of our own early cast iron. One effect of the Buddhist renaissance was the production in cast iron of numerous objects of a religious character, of which a larger proportion have been able to escape the tendency to return to the melting furnace.

Another point of interest in connection with early Chinese cast iron is apparent high quality. The metallographic work on the dated specimens collected last year has only just begun, but it seems probable that they will all prove to be remarkably fine-grained and of high quality. This is not surprising since the Chinese reduced the ore to spongy iron in crucibles in coal-fired natural-draft furnaces, and then melted this metal, mixed with coal and ore, in crucibles heated in a blast-blown furnace. They thus obtained a molten metal that did not necessarily contain the 3½ per cent carbon characteristic of the normal product of a blast furnace, and it will be interesting to learn how much carbon these castings contain. There seems no basic reason why this method could not have been developed to a point where the production of steel castings might have been possible, but the Chinese seem never to have made steel in this way; until quite recent years razors and other cutting tools were produced by the ancient method of carbonizing wrought iron that had first been worked into the desired shape.

Iron Followed Bronze

Another interesting point in regard to Chinese iron castings is that they appear to have been produced soon after the art of casting in bronze was developed. Throughout the rest of the world bronze castings are found that are 3000 years or more older than the earliest iron castings in the same region. The explanation apparently is that the metallurgical techniques elsewhere used allowed the melting and casting of bronze but would not permit the melting and casting of iron. Charcoal seems to have been the fuel used in the early production of iron everywhere except in China where coal appears to have been used for that purpose (in North China at least) from very early times. The fuel consumption in iron production was so high wherever charcoal was used that it seems probable that it resulted in a metal more expensive than bronze, and consequently there was no incentive to make castings of it.

Bronze must have been expensive in early China, both the copper and tin having apparently been obtained from the southwestern region, then a frontier largely under the domination of native tribes. The earliest bronze castings so far found in China date from the Shang dynasty (1766-1122 B.C.) and until recently some scholars doubted that there were any that authentically could be dated earlier than 1122 B.C. No iron castings of so early a date now exist, or are likely ever to be found, for the reasons already given. But iron casting in 513 B.C. was referred to in terms which indicate that there was nothing novel or unfamiliar about it. In the Kuo Yu, in a description of the culture of the Chou Dynasty (1122-255 B.C.) there is a list of the tools of iron that a woodworker, a seamstress, and a farmer should have.

Since Chinese plowshares, as far back as they can be traced, have always been made of cast iron, it seems reasonable to believe that cast iron appeared in China only a relatively few centuries after bronze was first cast there, instead of thousands of years later, as is typically the case in other metal-working regions. Low-sulphur coal deposits with iron ore occurring immediately beneath them in the geological sequence, and the early adoption by the Chinese of techniques which made the melting and casting of iron easy and cheap, seem to have been the determining causes which produced this result. The evidence that the Chinese were the first people of the world to produce iron castings on a commercial and extensive scale is convincing and complete.

Reading Association Is Formed

Reading Foundrymen's association was organized several months ago to include foundrymen in and adjacent to Reading and Berks county, Pa. The association has the following officers: President, Julian B. Greenstreet, Textile Machine Works; vice president, E. J. Snell, Keystone Foundry Co.; treasurer, G. W. Shomo, Confer-Smith & Co.; secretary, H. C. Cummings, 24 North Sixth street, Reading; executive committee, M. G. Moore Jr., Empire Steel Casting Co.; Louis Laroche, Dick Bros. Inc.; D. S. Light, Gray Iron Foundry; E. K. Mark, Penn Foundry & Mfg. Co.; J. S. Hinkley, Reading Hardware Corp.; and C. H. Meminger, Lancaster Iron Works Inc.

Western Metal Congress and Exposition will be held March 21 to 25, 1938 at the Pan-Pacific auditorium, Los Angeles, Calif., under the auspices of the American Society for Metals. The exposition will be a complete cycle of the metal industry, including raw materials, supplies, materials handling, welding and cutting, oil field equipment, small tools and finished products.

ADVERTISING PAGES REMOVED

Pattern and Gating

(*Concluded from page 26*)

narrow gates to the underneath side of the ring where it filled in the mold, coming up in four risers as indicated. All question of drossing was eliminated, as also was shrinkage. The metal used for this alloy was one containing both silicon and lead. The author knows of no worse mixture.

To get a bushing made of a high shrinkage alloy such as aluminum bronze so that it will be fed uniformly and be entirely free of dross also presents difficulties. The form of gating, shown in Fig. 10, was first seen by the author at the Lumen Bearing Co. It may look as though the cost of molding was high. This is more than offset by the regularity with which one can obtain dross free and shrinkage free bushings.

All gates and sprues referred to in this paper are assumed to have been made from patterns which themselves have been the result of consultation between the metallurgist and the foreman molder. The leaving of the cutting of the gates and sprues to the individual molder has nothing whatever to recommend it.

It is, of course, important to remember the interrelation of pouring temperature and size of gate. To get a casting to run means that the metal must reach the place farthest from the point of entry in a fluid condition and hot enough to join up with the opposing stream of metal if necessary. If this does not occur, the temperature may be raised or the gate enlarged, or both.

Another point is that if a block is to keep out dross, the entry into the block must be larger than the exit to the casting in order that the rush of metal may carry the cross above the exit point. Also the point of exit must be below the point of entry. This might sound axiomatic but there are many occasions when these simple points are forgotten.

Aluminum Pattern For Iron Base

(*Concluded from page 29*)

board was bolted to the arm at the proper height.

The chamfered striking edge of the board was designed to form the inner or hollow face of the pattern, plus contraction allowances, one for the proposed aluminum pattern, and the other for the iron castings to be made from this pattern. The drag half of the mold was rammed and swept to shape as shown in Fig. 2. The spindle and sweep were removed, after which the hole left by the spindle was plugged with waste, covered with a layer of sand and slicked down flat.

Parting material was shaken over the surface and then the cope was set in place with a gate pin in one corner. The drag face was covered with new sand passed through a fine sieve. A few gaggers were placed near the center to carry the hanging body of sand. The sand in the cope was rammed carefully to prevent knocking the toes of the gaggers below the surface. When the cope was lifted off the surface was clean and true and required practically no finishing with the tools.

In the next stage of the process, the sand in the drag, with the exception of a strip near the edges of the flask, was removed to a depth of about an inch. Space in the center was provided for the hub and a thickness of fine facing sand. The waste plug was removed and the spindle and original sweep replaced. An extension piece was screwed to the main sweep to cut away the sand and thus form the cavity for the metal. The extension also formed the hub. With a vent wire the face of the mold was vented down to the bottom plate. The tops of the holes were finger plugged and then a layer of fine sand was spread over the surface and pressed down to a suitable hardness for the reception of aluminum at a temperature of 1300 degrees Fahr. The sweep then was revolved a few times to impart the necessary and finished contour. The mold at this stage is shown in Fig. 3.

After the spindle was removed a lightner core was placed in the hub as shown in Fig. 4. This core equalized the pattern thickness and prevented any draw or shrink. Later, in service a wood plug in the hole was used for attaching the draw screw.

In view of the mold for one of the iron castings, Fig. 4, the reason for the elongated hub on the pattern is shown. The full width of the hub is utilized for a core print. The *stepped* round core shown in solid black rests firmly in the print. As an added precaution a single nail bearing on top of the core was pushed into the shoulder of the mold. The core provided 1/16-inch clearance for the pipe table support, which was anchored in place with a $\frac{3}{8}$-inch set screw. The 20 castings were given a coat of black paint and delivered in time for the following week end party.

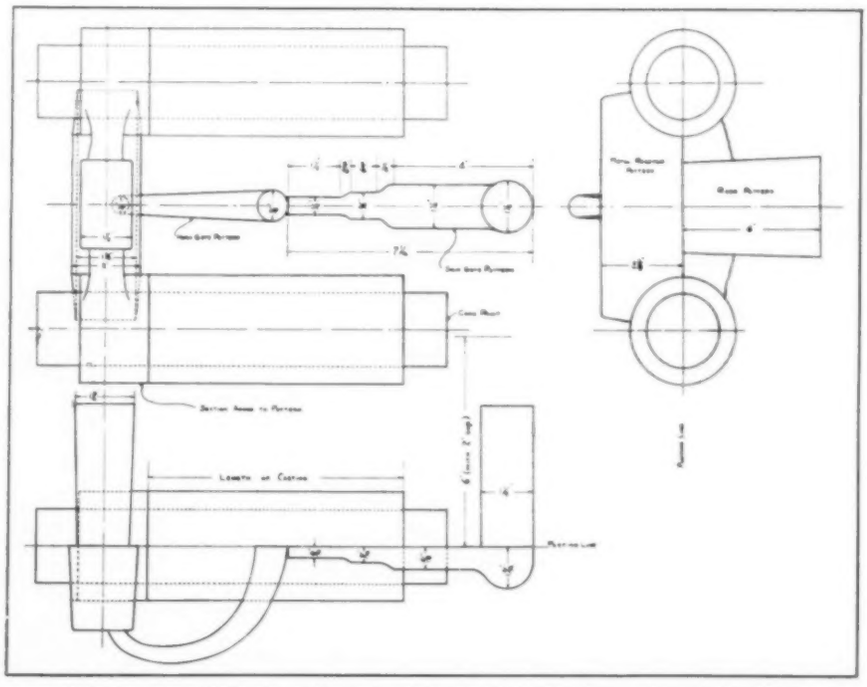


Fig. 10—A method of gating to obtain a solid aluminum bronze bushing

Sets Up Fellowship

A research fellowship to run three years and pay $1200 annually, has been established in the department of metallurgy at the Carnegie Institute of Technology, Pittsburgh, by the International Nickel Co. Inc., New York. Richard T. Myer, graduate student at Purdue university, has been selected to receive the scholarship. He will perform his studies under the direction of Dr. R. F. Mehl, head of the department of metallurgy.

Fig. 3—Sectional view of the assembled furnace

Change the Weather

(*Concluded from page* 31)

air on the other side.

Because of the deep, diagonal corrugations, the gases within set up a whirling motion. Fresh air, coming into contact with the walls of the radiator at the bottom, works its way upward, and because of the scrub-board shape of the corrugated walls, virtually scrubs the heat from the inside of the radiators.

Fresh air is drawn in from the basement of the home, the outdoors, etc., to the base of the unit. Here it is transmitted by twin blowers made by the Peerless Electric Co., Warren, O., throug large filters of spun glass saturated in oil. These filters are supplied by the Owens-Illinois Glass Co., Toledo, O., and remove dirt, dust and other particles. Automatic controls, including an electrically operated gas valve, room thermostat, pilot shut-off valve, safety limit switch, single speed and twin speed controls, are made by the Minneapolis-Honeywell Regulator Co., Minneapolis.

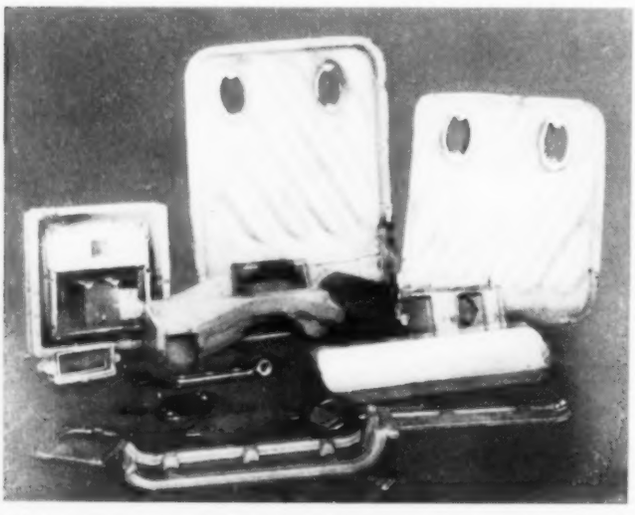
Because of space limitations a description of other types of unit heaters for the commercial and residential conditioning of air and a discussion of the other important phases of the industry, summer conditioning, cannot be included. Continued use of casting products from the foundries throughout the United States in air conditioning units would seem assured. The total 7-month value of orders booked by 98 manufacturers from January to July, 1936, according to statistics from the bureau of census, Department of Commerce, Washington, was $4,520,854, in the unit heater group alone. It is said that industry will employ over 500,000 men in the manufacturing and installation of equipment, operation and maintenance, and that $1,000,000,000 of sales will be made in the entire industry within the next six years. During 1935, 17.9 per cent or $8,592,000 of sales were made in complete home units.

All of these statements are encouraging as a stimulant to the foundry industry. Much has been done in a remarkably short time to refine airconditioning. As education continues, nearly all homes and buildings will (be air conditioned) contain conditioned air. Hay fever will be a rare affliction and the dust nuisance will have vanished. Common colds and their complications, including pneumonia, will be less prevalent. Antique furniture will not crack. Pianos will stay in tune for years. The value of it as a hot weather business stimulant and a cold weather token of comfort has been conclusively proven. Good air builds business and health. With the foundry industry keeping pace with further developments, possibilities seem almost limitless.

Fig. 6—Lighter work is molded on jolt squeezer machines

Explains Treatment Of Metals

Dr. Harry K. Ihrig, Globe Steel Tubes Co., presented an interesting talk on "Ihrigizing Metals—Making Them Resistant To Wear, Corrosion and Heat," before the Milwaukee District Chapter of the American Foundrymen's association on May 21 at the Schroeder hotel. Dr. Ihrig showed specific examples of castings that had been treated by the process and subjected to acid, heat and wear. He also gave illustrations of castings and machine parts both in the treated and untreated condition, and explained the advantages of treatment in increasing the life of the casting.



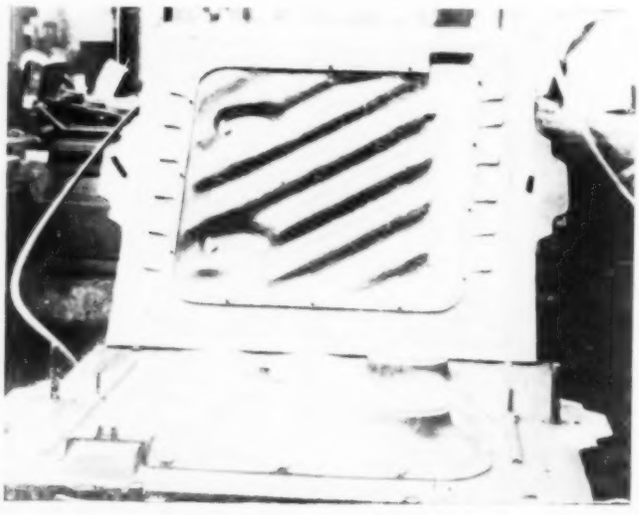


Fig. 4—Gray iron castings used in the furnace assembly. Fig. 5—Drag molds for the furnace fronts and side drums are made on power roll-over machines

You Get

QUALITY plus ECONOMY

when you use

GLUTRIN
Reg. U. S. Pat. Off.

(liquid)

"The all purpose aids to Foundry Practice"

GOULAC
Trade-mark

(powder)

If you use core oil or pitch, it will pay you dividends to investigate the savings which can be made through the use of GLUTRIN or GOULAC. Substituted for 25 to 50 percent of your core oil, they cut baking time in half. Added to your pitch mixes, they will double your sand to pitch ratio. These savings are further magnified when you consider that the cost of these materials is surprisingly low.

Used by the leading foundrymen everywhere, these products are highly recommended for use in tempering, skin-dry work, facing (both green and dry sand), corebinder, paste and spray. Let GLUTRIN and GOULAC help you get better castings at lower cost. Write TODAY for samples and booklets explaining their use. Our demonstrator will gladly call on you.

These Materials May Be Obtained Through The Following Jobbers

BIRMINGHAM, ALA.
Hill & Griffith Co.
BOSTON, MASS.
Cutter, Wood, and Sanderson Co.
BUFFALO, N. Y.
Geo. F. Crivel & Co.
F. B. Stevens, Inc.
Whitehead Bros Co.
CHICAGO, ILL.
Federal Fdy. Supply Co.
Hill & Griffith Co.
S. Obermayer Co.
CINCINNATI, OHIO
Hill & Griffith Co.
S. Obermayer Co.
CLEVELAND, OHIO
Federal Fdy. Supply Co.
Smith Facing & Sup. Co.
DAYTON, OHIO
Fenton Fdy. Supply Co.
DETROIT, MICH.
Federal Fdy. Supply Co.
F. B. Stevens, Inc.
INDIANAPOLIS, IND.
Hoosier Supply Co.
LOS ANGELES, CAL.
Chamberlain Co.
MILWAUKEE, WIS.
Donald Sales & Mfg. Co.
Federal Fdy. Supply Co.
S. Obermayer Co.
MINNEAPOLIS, MINN.
Federal Foundry Supply Co.
Frost Naus Co., Inc.
NEWARK, N. J.
Obermayer-Newark division of Springfield Facing Co.
NEW HAVEN, CONN.
F. B. Stevens, Inc.
NEW YORK CITY, N. Y.
Federal Fdy. Supply Co.
C. E Pettinos Co.
Whitehead Bros. Co.
OAKLAND, CAL.
Pacific Graphite Works
PITTSBURGH, PA.
J. S. McCormick Co.
S. Obermayer Co.
PHILADELPHIA, PA.
Geo. F. Pettinos, Inc.
PROVIDENCE, R. I.
Whitehead Bros. Co.
RICHMOND, VA.
Federal Foundry Supply Co.
SALT LAKE CITY, UTAH
Utah Foundry Supply Co.
SAN FRANCISCO, CAL.
Snow & Galgiana
SPRINGFIELD, MASS.
Springfield Facing Co.
ST. LOUIS, MO.
M. A. Bell Co.
M. W. Warren Coke Co.
MONTREAL & TORONTO, CANADA
Canadian Foundry Supply & Equipment Co., Ltd.

ROBESON PROCESS CO • AMERICAN GUM PRODUCTS CO.

General Offices: 230 Park Avenue, New York City

CARLOAD SHIPMENTS: GLUTRIN—from Au Sable Forks, N. Y., and Erie, Pa. GOULAC—from Erie, Pa.

Lighted Vent Fallacy

(*Concluded from page* 32)

to be unable to understand why with my engineering training I had not arrived at the same conclusion. He did not attach any importance to the theory that the possibility of increase in the atmospheric pressure in the vicinity of the jet would affect the conditions in the theories he had outlined.

At the office of a public utility gas company I found that while no data were available on this particular subject, the engineers were very courteous and professed interest in the points raised. While making no definite statement they held to the opinion that if there was any difference in the rate of flow, it would be too small to be of any practical significance. However, to confirm the opinion they ran several 5-minute tests on the regular gas stove, pilot and bunsen burners. No appreciable difference in gas consumption was found between the lighted and unlighted condition.

Later we set up the apparatus shown in Fig. 2 to determine whether there was any difference in time required for a definite volume of gas to flow through an orifice, lighted or unlighted. The apparatus was connected directly to the distributional gas line. A pressure governor was placed on the gas line near the meter. The governor took care of any fluctuations in pressure. The flow of gas through the meter was constant throughout the experiment. The regular testing meter was used, capable of recording the flow of gas accurately to within 0.005 cubic foot. A small rubber tube attached to the meter outlet terminated in a small brass tube with an ⅛-inch orifice.

A small quantity of gas was allowed to flow through the meter to assure elimination of all air in the apparatus. The results of four tests are shown in the accompanying table. In each case ½-cubic foot of gas flowed through the same opening. The first and second tests showed a difference of 24 seconds, or 6 per cent more time for the lighted jet. In the third and fourth tests the difference in time was 30 seconds, 8 per cent more time for the lighted jet. Further experiment was not considered necessary.

Results of these four tests showed the fallacy of the somewhat widely held opinion that gas flows more rapidly through a lighted jet. Further tests with different size openings, rate of flow and pressure would be of interest, but we incline to the opinion that under any condition the results would not differ from those shown. This experiment also seems to support the theory that an increase in atmospheric pressure in the vicinity of the lighted jet, retards the flow of gas. Also that the only benefit derived from lighting the vent is to remove obnoxious gas fumes, and to prevent the possibility of gas mixing with air to form an explosive mixture.

Purdue Makes Report On Foremen

An engineering bulletin covering a report of the foremanship training programs in Indiana industries has been published recently by Purdue university, engineering extension department, Lafayette, Ind. The report covers the years from 1919 to 1936. The program on foremanship training consists of a series of discussion meetings or conferences held at a time and place convenient to the industries being served.

The various features are described briefly in the booklet, including the foremanship training program, foremanship conferences for industry, leadership conference groups and civilian conservation corps meetings. An appendix of the groups served in 104 Indiana cities is included at the close of the bulletin.

National bureau of standards, department of commerce, Washington, has published research paper RP 923 entitled "Young's Modulus of Elasticity, Strength and Extensibility of Refractories in Tension" by R. A. Heindl and L. E. Mong. Copies of the paper may be secured from the superintendent of documents, Washington, D. C. for 5 cents.

New England Group Stresses Safety

Guy Rhodes, in charge of safety work for the foundry group of the General Electric Co., Everett and Lynn, Mass., plants, reviewed the foundry safety work of that organization at the regular meeting of the New England Foundrymen's association held at the Engineers' club, Boston, May 12. Mr. Rhodes explained that after a new employe has passed a physical examination he is taken into the foundry by the safety man and introduced to the foreman for whom he is to work. The new employe is given two pamphlets, one is entitled "Safety Instructions and Information," which is prepared by the National Safety Council and the other is a statement which he signs indicating his willingness to conform to a safety program. The speaker stated that all men are urged to wear safety shoes and that the company has made it convenient for the employe to purchase a pair on the time basis.

Mr. Rhodes also discussed the equipment necessary for blast room operators and stated that the helmet employed passes air at pressures from 12 to 25 pounds per square inch to prevent dust from entering the helmet from below. Helmets are blown out each 24 hours to prevent accumulation of dust. Mr. Rhodes explained that a penalty is imposed upon an employe who fails to use safety goggles where directed. Chains are inspected every week and large chains are inspected after every heavy or unusual load. In addition chains are annealed every 6 months. The practice is to anneal at 1160 degrees Fahr., holding for 1 hour, allowing the chains to cool off in an annealing furnace rather than in air. Mr. Rhodes mentioned a new type of molybdenum steel which is reported can be used without the necessity of annealing.

Floors are wet down every 3 weeks with mineral oil which tends to keep the dust down. A non-skid pad in the form of an asbestos shingle is used in front of saws and planers in the patternshop. Mr. Rhodes also described the form used when a man violates a safety rule. This is regarded as a record disciplinary action and men, after being warned, are obliged to sign a slip indicating their knowledge of a violation of a safety rule. This serves as a company record in the event that criticism is made of the company by the employe for a layoff, which might be influenced by a careless attitude. Mr. Rhodes concluded by explaining that complete reports of conditions under which an accident takes place are made out and that furthermore methods of preventing a similar accident are determined upon.

Test Speed of Gas Flow

1—½ cubic foot gas	Jet unlighted	6 minutes, 28 seconds,
2—½ cubic foot gas	Jet lighted	6 minutes, 52 seconds
Difference of 24 seconds, or 6 per cent more time for lighted jet		
3—½ cubic foot gas	Jet unlighted	6 minutes, 22 seconds
4—½ cubic foot gas	Jet lighted	6 minutes, 52 seconds
Difference of 30 seconds, or 8 per cent more time for lighted jet		

Control Prevents Silicosis

(*Continued from page* 34)

available will not control dust conditions if superintendents, foremen and workmen are careless, dirty and disorderly in their work. Good housekeeping is unquestionably the cheapest single method of dust control.

The first step in introducing a good housekeeping program is to teach the workmen how to do their work properly. Too often, instructions are given hastily and employes are not followed up to see that instructions are understood.

Manufacturing processes should be well planned and proper storage facilities should be provided so that there need be no unnecessary shop fixtures on working floors.

Different Cleaning Methods

There must be a constant campaign of cleaning. The following suggestions are made for use whereever possible:

1. Use of water under pressure: This method has been successfully used in cleaning the interior of many buildings.

2. Combination of water and air: The air pressure provides sufficient force to dislodge the dust while the water aids in settling the dust.

3. Vacuum cleaning: Vacuum cleaning has the advantage of removing the dust without dispersing it into the atmosphere.

4. Brushing: This method is particularly adaptable to cleaning buildings of older type of construction.

5. Use of steam: The committee has been advised that low pressure steam can be used to advantage.

All cleaning should be done, if possible, outside of working hours and men engaged in this operation should be provided with dust respirators in accordance with suggestions made under the respective subcommittee report.

The following methods for keeping a building interior free from dust by proper maintenance are discussed in the complete subcommittee report:

1. Maintenance of equipment: A program of equipment maintenance is outlined which is advisable both from the point of view of reducing the dust hazard and also from that of increasing operating efficiency and operating cost.

2. Floors: Dust should not be allowed to accumulate on the floors and aisles but should be removed by methods which do not disseminate dust into the atmosphere.

3. Elimination of bad practices: Large amounts of dust can be stirred up merely by what may be termed *bad practices*. Probably the greatest offender in this class is the careless use of the air hose. Other bad practices which should be avoided are pointed out.

4. Importance of supervision: If a good housekeeping program is to be a success, it must be supervised by a responsible person assigned to the task. It is only by careful operation, maintenance and technical checking with suitable instruments that dust control measures can be effective.

Artificial Ventilation Necessary

In industries in which high temperatures are met, it is common practice to obtain ventilation by simple stacks or by room ventilators of which the capacity varies from 200 or 300 to some 15,000 cubic feet per minute. Since the effectiveness of natural ventilation is dependent largely on atmospheric conditions, local conditions may preclude entirely reliance upon general ventilation. General ventilation, in mine, tunnel or factory, usually requires assistance from an appropriately-placed fan, with or without duct work.

A complete dust-exhaust and collection system consists of four parts:

1. Exhaust hoods.
2. Piping or duct system.
3. Air-cleaning equipment.
4. Source of suction.

The basic factors under each of these items is discussed in some detail in the major report and reference are given to complete works on these subjects.

The design of exhaust hoods has been discussed in considerable detail for a number of applications. Representative velocities which should be obtained at the face of the hoods are given in the complete report of this subcommittee.

In designing hoods and enclosures for jobs for which there are no reliable data, it is usually advisable to make experimental or probing hoods and actually try them under practical operating conditions. From the information thus gained, permanent hoods may be designed for the jobs in question.

The piping must be so designed that the velocities are great enough to carry all of the dust caught by the hoods without settling in the horizontal runs of pipe. If the dust is mixed with large materials which might injure the fan or dust collector, it is advisable to place preliminary separators or traps between the hood and arrester.

Equation for calculating velocities needed to transport materials pneumatically have been worked out by Dalla Valle and Marten. Generally velocities of less than 2000 feet per minute should not be used in duct work. Casting tumbling mills require about 5000 feet per minute in the branch pipes because of heavy concentration of dust. Grinding and polishing systems function properly with a 4500 feet per minute branch pipe velocity and 3600 feet per minute header pipe velocity. A fair average found in dust collecting exhaust systems is from 3500 to 5000 feet per minute.

Primary dust separators depend for their air cleaning action on centrifuging out the dust particles or on imparting to the transporting air stream a quick change in direction, accompanied by a sudden reduction in velocity. They may be applied to exhaust systems from polishing and buffing wheels and, in some cases, as a preliminary separator ahead of a final dust arrester.

To Remove Dust Particles

Dust particles which cannot be caught in inertial separators are usually removed by one of the following methods:

1. *Filtration:* Of the filter arresters the cloth type, either of the screen, envelope or bag construction, is most generally used for industrial exhaust systems. Cloth arresters properly engineered for this job and handling dust for which they are suited give good efficiency.

2. *Wet Collectors:* Wet collectors have been in use for many years but only recently have they been introduced for collection of industrial dust from exhaust systems. They are particularly applicable where moisture is present in the air being exhausted. The resistance is relatively low in wet collectors suitable for dust removal and remains constant for a given exhaust system.

3. *High Tension Electrical Precipitation:* High tension electrical precipitation has been applied to removal of dust, fumes, and mists from air and other gases, but even though it has many advantages, it has not so far been extensively applied to this field.

4. *Dynamic Precipitators:* This equipment effects removal of entrained dusts by a specially designed fan in which the rotating element imparts a centrifugal force to the dust particles. Originally these precipitators were intended for the collection of dry dust, but recently the construction has been modified to permit the introduction of water into the dirty air intake, thus increasing its application to more kinds of dust. Consideration must be given to the types of dust handled.

Appraisal of Results

A complete dust collecting system

designed to accomplish the two objectives of (1) removal of dust at the source or point of dust dispersion, and (2) collection of the dust after it has been drawn into the hood. Tests should be made frequently to determine that the air velocities are being maintained for which the system was designed. Tests should be made of the amount of dust in the vicinity of operators of dusty processes to learn whether the system is accomplishing its function.

Water To Suppress Dust

Water and other liquids are employed in three different ways to control dust in industry:

A.—To suppress dust at its point of origin.

B.—To remove dust from the air after it has escaped from its source.

C.—As a means of preventing the redispersion of dust which has settled out.

A. Representative of the first group is the use of water or other liquids with such operations as rock-drilling and handling, pulverizing and milling of rock and ore, grinding of metals on grindstones, abrasive-wheel cutting of granite and sandstone. To insure maximum wetting, three fundamental factors must be observed:

1.—Secure the most intimate and violent contact between the dust and the liquid and maintain this contact as long as possible.
2.—Apply the liquid directly at the point of dust generation and exclude all air if possible.
3.—Employ wetting agents such as oils, liquids of low surface tension and foam producers to increase the wetting efficiency.

B. Water sprays are used in mines and over shake-out operations in foundries, but there has been some question about the extent of dust control by such measures.

C. Maintaining continuously wet floors, walls and other surfaces will, in many cases, prevent the redispersion of settled dust. Practical objections sometimes limit the applicability of this measure.

The widespread use of water in the South African gold mines together with improvement in general ventilation has contributed largely to the reduction in dustiness with subsequent control of silicosis during the past 20 years.

The diminution in dust concentrations produced by wet methods in certain operations in the anthracite coal mines in this country are tabulated in the report. In South Africa much importance is attached to the use of the so-called "dustless" wet drill which is designed so as to prevent the delivery of any air into the drill steel. Wet drilling has been found to reduce dust concentrations materially.

In the granite industry, routine wetting down of floors and walls and of the stones themselves is an effective procedure. Water sprays on pneumatic surfacing machines are not generally successful. Continuous application of water to reciprocating and circular saws and to abrasive cutting wheels in this industry have been found to be effective.

The use of water or oil on walkways and other areas away from the pouring floor now is fairly common practice in many foundries and even the pouring area is kept damp much of the day. The hydraulic core knock-out is increasing in use, and water sprays are being employed over vibrating shake-out tables. In foundries handling small castings, flasks and their contents may be wet down as soon as the temperature of the casting permits and the water should continue to be used during the entire process of shaking out. Wet tumbling can be employed in certain cases.

The use of water on grinding wheels is not an effective method of dust control compared with the use of good exhaust hoods. This also holds for wet truing-up of grinding wheels.

The second and concluding section of the report by the engineering committee will be presented in the July issue.

THE EDITORS

Discusses Accidents And Diseases

United States department of labor, division of labor standards, recently has published bulletin No. 10 entitled "Discussion of Industrial Accidents and Diseases." The text constitutes a report of the discussions at the 1936 convention of the International Association of Industrial Accidents boards and commissions, which was held at Topeka, Kans. The publication may be obtained from the superintendent of documents, Washington, for 20 cents.

To Rebuild Plant

Charles A. Krause Milling Co., Milwaukee, will rebuild its corn and specialty mills as rapidly as possible. Plans for the new mills are being drawn and much of the machinery has been ordered. The company anticipates being in production around the first of the year.

Capacity of the corn and specialty mills will be larger than that of the former plant, which was destroyed by an explosion in April. It is pointed out that building from the ground up will give the company the opportunity to incorporate new ideas and developments in that field.

Quad-City Chapter Elects Officers

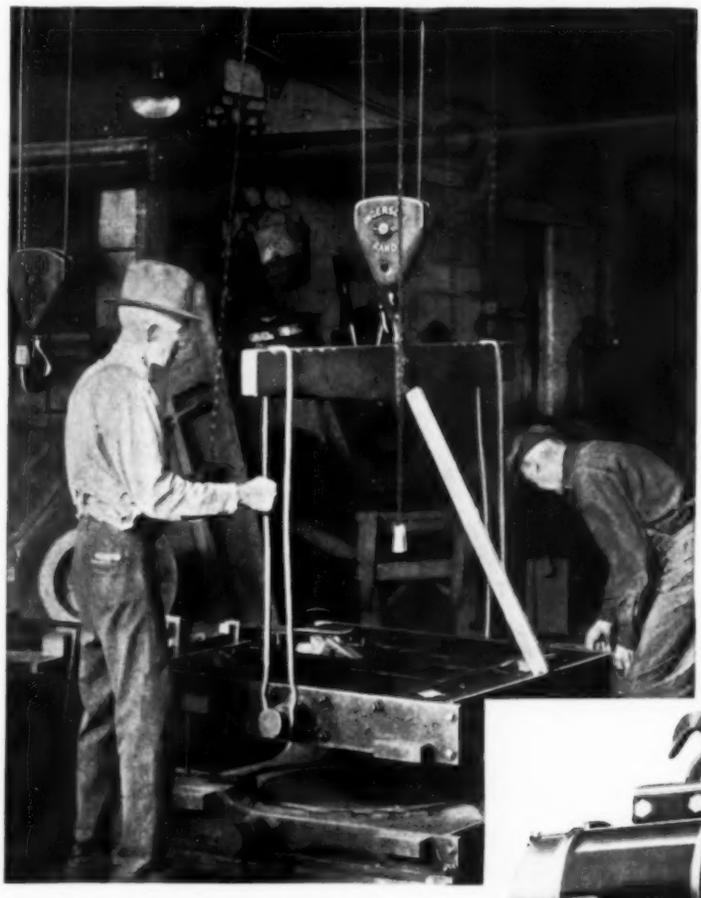
The Quad-City Chapter of the American Foundrymen's association elected the following officers at a meeting held May 17 at the Blackhawk hotel, Davenport, Iowa: Chairman, P. T. Bancroft, Moline, Ill.; vice chairman, M. J. Gregory, Caterpillar Tractor Co., Peoria, Ill.; secretary-treasurer, J. Morgan Johnston, Tri-City Manufacturers' association, Moline, Ill.; directors, T. J. Frank, H. Bornstein, F. W. Kirby, J. H. Ploehn, F. J. Danan-folser, A. E. Hageboeck, H. A. Deane, C. H. Burgston, and E. A. Gullberg. The retiring chairman, T. J. Frank, also was elected to the board of trustees to serve for a term of 3 years.

J. H. Ploehn, French & Hecht, Inc., and chairman of the educational committee of the Tri-City Manufacturers' association, spoke on the apprenticeship work in the foundry industry as compared with other localities. Twenty apprentices who had taken part in the local molding and patternmaking contest were present and were introduced. Following the talk, Mr. Ploehn presented the local prizes in both divisions. He also mentioned that three of the six winners had won prizes at the Milwaukee convention as follows: Fred Osterman, International Harvester Co., Rock Island, first in molding; Albert Lamp, Blackhawk Foundry & Machine Co., Davenport, Iowa, third in molding; and George Sharrar, French & Hecht Inc., Davenport, third in patternmaking.

C. V. Greenwood, personnel manager, International Harvester Co., Rock Island, Ill., spoke on "Industrial Personnel Management." Mr. Greenwood covered the qualifications and importance of a man in personnel work in any industrial concern. He stated that a personnel man must be able to select and hire men for all grades of positions in the organization. He expressed the opinion that this is one of the biggest jobs in any industry, since in laying the proper groundwork of employe relationship, considerable trouble may be avoided in the future. It was pointed out that all supervisors and sub-supervisors should be close to their men and understand them as well as the work.

Other parts of personnel work such as safety and education for workers, apprentices, etc. were discussed. In speaking of these fields of activity, it was stated that they should be made a means of letting the worker know of some of the company's policies and the reasons for existence of such policies. Many questions were asked following the formal discussion.

GIVE YOUR MOLDER A *Lift!*



The I-R line of pneumatic tools for foundry work also includes chippers, core breakers, rammers, grinders, wire brushes, etc., also a complete line of air tool accessories.

In foundry service I-R Air Motor Hoists are unsurpassed. They are safeguarded from the effects of heat and dust and because they are free from vibration and their control is so nicely graduated, they are especially fitted for delicate work such as drawing patterns or lowering a cope onto a drag.

In addition, I-R hoists can't be hurt by overloading. They maintain their efficiency for years. They are made in nine sizes, from 500 lbs. to 20,000 lbs. capacity.

Ingersoll-Rand

11 BROADWAY, NEW YORK CITY

362-8

Special Pig Irons

(*Concluded from page* 35)

is cumulative and finally gets to the point where the production of quality castings is difficult.

The fundamental causes are not quite so clear. We still have much to learn about the metallurgy of gray cast iron. However, we do know that no mix for general foundry work appears to be really satisfactory unless it includes a certain minimum amount (usually 10 to 20 per cent) of virgin metal, that is, metal reduced directly from iron ores.

Two different foundries making the same line of castings will not necessarily secure the best results from the same mix. Mixes must be designed not only for the castings to be made but for the type of equipment and operating conditions met with in the particular foundry which is under consideration. It might be well to mention a few of the items that will affect the physical properties of the casting and which must be considered in designing a mix. These are: Type and capacity of blowing equipment; general construction of wind pipes and cupola; number, size, and shape of tuyeres; type of lining and material used and general practice followed in patching; cupola operating practice; method of handling metal from cupola to molds; general practice followed in molding, gating, and other phases.

It generally is conceded that chemical analysis does not describe completely the quality of a pig iron, nor its suitability for a particular application and that two pig irons of identical analysis but from different sources will not produce castings of the same physical properties. Just what causes these obscure differences in pig iron is a debatable point. Suffice it to say that the operator of a high class merchant blast furnace makes every effort to produce a uniform iron, uniform not only in chemical analysis, but also in other properties. This is accomplished by a close control of his raw materials and the furnace practice employed.

Since commercial scrap varies widely in quality and since there is no definite knowledge concerning its effect on the quality of the pig iron, the modern merchant furnaceman frowns upon the use of large amounts of scrap in the blast furnace and prefers a burden consisting 100 per cent of carefully selected ores. Similarly, to produce pig iron of uniform quality a furnace must be working smoothly and continuously which means a furnace that is modern, well constructed, well maintained, and intelligently operated according to the best accepted practice. A furnace blown hard to secure maximum tonnage is not likely to produce pig iron of a quality and uniformity required by foundries producing high grade castings.

In the production of high strength irons, low carbons are desirable and the foundryman early learned that low carbons are achieved by substituting special high silicon pig irons for the standard pig, and steel scrap for some of the cast iron scrap. With the rapidly increasing use of special high silicon irons in mixes for castings requiring, not high physical properties, but castings of maximum softness and freedom from shrinkage, again the question of carbon content becomes important. The proper carbon content to secure the desirable properties is not a fixed quantity but depends on the silicon content. An iron of high silicon content and a relatively low carbon will show satisfactory and more uniform properties over a wider variety of section sizes than an iron of relatively high carbon and low silicon content.

Other factors in cupola operation are equally, if not more important in controlling the carbon content in the iron at the spout than the nature of the metallic charge. We refer in particular to the amount of coke in the bed and between charges, the structure of the coke and its ash content, the melting rate at which the cupola is operated, the type and amount of flux used, the control of blast velocity and volume.

Wages Have Higher Buying Power

American factory wages, in terms of buying power, are higher today than ever before in the history of the country, according to a statement issued in connection with a Machinery institute pamphlet entitled "Technology and the American Consumer." The publication is the fourth of a series based on a study of the relation of industrial mechanization to the American standard of living. It points out that prices of 20 widely-used machine made products, measured in buying power of factory wages, are 63 per cent lower today than in 1914. A comparison is made between 1914 and today in the prices of 4 machine-made products in terms of the average factory worker's earnings per 8-hour day.

Elect Officers for Ohio Chapter

Approximately 150 members and guests attended the year's end meeting of the Northeastern Ohio chapter of the A.F.A. held at the Cleveland club, Cleveland, on May 20. Included in the guests were 33 apprentices in the foundry and patternmaking divisions of the Cleveland Trade school. Frank G. Steinebach, THE FOUNDRY, chairman of the chapter introduced D. C. Courtright, principal; J. G. Goldie, instructor in foundry practice, and Frank Cech, instructor in patternmaking in the Trade school, and then called upon James L. Wick Jr., president of the A.F.A. to present the prizes won in the recent nationwide apprentice contest.

Fred Henz, Western Pattern Works, Cleveland, received the first prize in patternmaking; Kazimir Paliwoda, Cleveland Trade school, received the second prize in steel molding, and Mike Kost, Cleveland Trade school received the third prize in nonferrous molding. Following the presentation of the prizes, Mr. Steinebach announced that officers submitted by the nominating committee and mentioned in the May issue of THE FOUNDRY were elected by unanimous ballot, and then turned the meeting over to the new chairman, B. G. Parker, Youngstown Foundry & Machine Co., Youngstown, O.

Mr. Parker introduced Fred L. Weaver, Great Lakes Foundry Sand Co., Detroit, who spoke on use of reclaimed core sand in preparation of synthetic molding sand. He first mentioned the necessity of obtaining a good distribution factor of sand grains to obtain the best permeability and a good surface on the casting. Mr. Weaver pointed out diagrammatically that additions of coarse sand do not necessarily increase the permeability, and as one example showed that a straight 70 mesh sand in which all grains were uniform in size, had a base permeability of 90. A combination of one-third 70 mesh, one-third 50 mesh, and one-third 100 mesh giving a grain fineness of 73 only showed a permeability of 78, due to a poor distribution factor.

Mr. Weaver then described an installation in a foundry where burnt core sand which previously had been discarded as waste was cleaned and screened, and used as the base for a synthetic sand.

When two men are carrying a load and one slips, it is not always this man who suffers an injury. Frequently the sudden shifting of the load to the other causes him to be injured.

ADVERTISING PAGES OMITTED

European Foundry Practice

Digest of Recent Literature Covering Various Phases of Castings Manufacture

Gates and Risers

Gates and Risers on Small Nonferrous Castings, by J. M. Douglas, *Foundry Trade Journal*, London, England, April 8, 1937.

This article discusses gating and risering of gun metal, brasses and nickel alloys, and is concerned with general principles rather than specialized examples. The author points out that pouring temperature is closely associated with gating, and particularly so in the case of gun metal. He advocates use of large gates in that alloy as they give sound castings over the whole pouring range from 1080 to 1220 degrees Cent. (1975 to 2230 degrees Fahr.).

In the gating of brass, the composition has an important effect, and to avoid difficulty with zinc oxide, the castings must be poured quickly. To facilitate that the gates must be large. Gates for nickel brass castings are similar to those used for yellow brass. However, as the nickel content increases, difficulty with shrinkage increases. A troublesome interdendritic shrinkage appears which gives the affected part a red color which might be attributed to metal trouble, but that is not the case as it can be overcome by gating properly. With high nickel content progressive solidification from one part of the casting to another is limited, and feeding metal must be supplied over the whole casting by a number of gates. The author illustrates his discussion with numerous sketches and photographs of gated castings.

Improved Irons

Modern Improved Cast Irons, by J. W. Donaldson, *Metal Treatment*, London, England, Spring Quarterly issue.

The author prefaces his remarks by stating that, as the result of comparatively recent investigations, it has become possible to produce cast iron with a strength of the same order as that of steel, with a high resistance to corrosion and with a high resistance to changes at elevated temperatures. He then describes briefly the Diefenthaler and Thyssen-Emmel processes of producing pearlitic structure iron through use of hot molds; Piwowarsky's work on superheating, and the innoculation of white iron by calcium silicide, nickel shot or ferrosilicon to produce high duty cast irons. The author also mentions the recent investigations on the application of 0.2 per cent titanium followed by gassing with carbon dioxide to yield graphite in a finely divided form.

He then discusses alloy cast irons involving the effect of nickel and chromium, and mentions recent work by Hurst on the joint influence of manganese and molybdenum wherein a completely white fracture is produced with 2.07 per cent molybdenum and 0.28 per cent manganese, or with 2.83 per cent manganese, and 0.39 per cent molybdenum. High hardness values are obtained with manganese and molybdenum in excess of 2.25 per cent and 1.0 per cent respectively. Heat resisting cast irons such as the 5 to 7 per cent silicon irons; 18 per cent nickel, 6 per cent silicon, and 2 per cent chromium irons, and 15 per cent nickel, 7 per cent copper, and 2 per cent chromium irons are described as are various corrosion resisting irons. The article closes with a discussion of the heat treatment of cast iron.

Alloys with Silver

A New Alloying Method for Bronzes (Eine neue Legierungsmethode fuer Bronzen), by R. Ozlberger, *Die Giesserei*, Duesseldorf, Germany, May 7, 1937.

Discussion in this article is confined to tin-bronzes containing about 92 per cent copper and 8 per cent tin, and more particularly that alloyed with 0.25 per cent nickel. By replacing part of that nickel content with silver, much better physical properties are obtained. Unfortunately however, the author fails to mention the percentage of silver employed.

Heat Treatment

Heat Treatment of Wear Resisting Gray Cast Iron (Waermebehandlung von verschleissfestem Grauguss), by R. Hanel, *Die Giesserei*, Dusseldorf, Germany, March 26, 1937.

The author discusses the influence of the structure of gray iron on its wear resisting properties as related to amount of graphite and its distribution, and the matrix of the iron. Since martensite has about 5 times the wear resistance of pearlite, he discusses the theoretical production of that structure, and its practical accomplishment.

Four methods available in practice are drastic cooling, alloying and quenching, alloying, and alloying to attain an austenitic structure followed by heat treatment. He points out that the first method is limited to laboratory experiments or very simple forms of castings. The second method of obtaining martensitic structure is partially through alloying and partially through cooling. Nickel is the alloying element, and is added in quantities of 1 per cent or more. With the lesser amount, quenching in oil is required, but as the amount of nickel is increased compressed air or still air quenching can be employed.

Increasing the nickel content to 13 per cent decreases the transformation point to 200 to 250 degrees Cent., and comprises the third method. No cooling or quenching is required to obtain a martensitic structure. However, with still air quenching the nickel can be reduced to 5 to 10 per cent, and with compressed air quenching martensitic structures can be obtained with 3 to 4 per cent nickel.

The fourth method involves the use of an iron containing 3.75 per cent manganese and 6.50 per cent nickel which is heat treated to obtain the desired martensitic structure. With that iron the highest physical properties excepting elongation are secured by heating at 600 degrees Cent. (1115 degrees Fahr.). With all the various procedures given, the author has included charts to show the effect of various drawing temperatures.

OBITUARY

J. BEVER, 75, for over 30 years foundry manager, Otis Steel Co., Cleveland, before his retirement in 1930, died in his home in Lakewood, O., May 31. Mr. Bever was born in Germany Aug. 6, 1862, and with other members of his family arrived in the United States in 1873. As a young man he worked for the Walker Mfg. Co., Cleveland, first as shipping clerk and later as an apprentice in a course which included terms in the drawing office, pattern shop, foundry and machine shop. Returning to the main office he served in turn as accountant, office manager, purchasing agent and general auditor. In 1899 he joined the Otis Steel Co., in charge of foundry sales. Later he was appointed foundry manager and remained in that capacity until his retirement in 1930. Mr. Bever was a member of the American Foundrymen's association, the American Society of Mechanical Engineers, American Iron & Steel Institute, Cleveland Engineering society and various public service and fraternal organizations. He is survived by his widow, two daughters and three sons. One son, Clarence A., is superintendent, steel foundries and roll shops, Bethlehem Steel Co., Bethlehem, Pa.

• • •

Joseph D. Wolkow, 72, retired head of the F. Wolkow & Son Co., brass founder, Louisville, Ky., died May 4. He was a native of Poland.

• • •

Charles Brown Stowe, 75, former president and chairman of the board of the Stowe-Fuller Refractories Co., Cleveland, died in Cleveland May 10.

• • •

Charles E. Nordfeldt, 65, works manager and one of the founders of the Massillon Steel Casting Co., Massillon, O., died at St. Petersburg, Fla., April 30. Mr. Nordfeldt was one of the most widely known men in the steel casting industry.

• • •

SAMUEL L. BUCK, 64, vice president and director, Taylor-Wharton Iron & Steel Co., High Bridge, N. J., died May 11. Mr. Buck was born in Weatherley, Pa. and had been with the company for 37 years, serving as vice president and director for the past decade.

• • •

Leonard M. Eyke, 58, president of the Terre Haute Malleable & Mfg. Co., Terre Haute, Ind., died March 19 in that city. Mr. Eyke went to Terre Haute from Muskegon, Mich., 35 years ago to found the company which became a leader in Indiana industrial activity.

• • •

ROBERT C. CAMPBELL, 39, an engineer with the American Radiator Co., New York, died May 21 in Norfolk, Va. Mr. Campbell, who had been employed by that company for 20 years, returned to the United States about 3 years ago after serving as company manager for Scandinavian countries with headquarters abroad.

• • •

Thomas H. Conway Sr., 72, founder of the Lincoln Stove & Range Co. and Fremont Stove & Range Co., both of Fremont, O., and the Regent Stove & Mfg. Co., Detroit and Wyandotte, Mich., died recently in Detroit. A pioneer in the manufacture of stoves, he was born in Toledo, O., and retired from active business 5 years ago. Mr. Conway had served as president of the Great Lakes Mfg. Co., Wyandotte.

• • •

CHARLES E. HEATH, 65, vice president and general manager, Fate-Root-Heath Co., Plymouth, O., and widely known for his pioneer work in diesel motor development, died recently at his home in Plymouth. Born in La Grange, O., Mr. Heath was reared in Medina, where he attended the public schools. He started as a mechanic with the A. I. Root Co., Medina, O. in 1890 and rose to an executive post in the firm in which he later became a partner.

• • •

JOHN L. MCKINNEY, 94, a founder and director of the American Radiator Co., New York, died in Ttitusville, Pa. May 20. Mr. McKinney's affiliation with the American Radiator Co. resulted from his part-ownership of the old Titusville Iron Works. In 1889 he and other iron producers including John B. Pierce and Clarence M. Woolley, formed the American Radiator Co. Mr. McKinney was a director of the company from the time of its inception until his death.

• • •

STILLMAN WITT EELLS, 61, at one time secretary of the Chicago Drop Forge & Foundry Co., Chicago, died in New York recently. Mr. Eells became secretary of that company after his graduation from Yale university in 1895 and later was made an official of the Alignum Co., New York, and a director of the Sandusky Portland Cement Co., retiring in 1904 from an active business life. After his retirement from business, Mr. Eells became American consul to various foreign countries.

• • •

Dr. Frederick C. Langenberg, 47, vice president in charge of research, United States Pipe & Foundry Co., Burlington, N. J., died at his home in Edgewater Park, N. J., April 4. He was born in Beverly, O., and received degrees from Ohio university and Harvard university. Dr. Langenberg taught metallurgy at Harvard until 1915, when he became metallurgist at the Watertown Arsenal, Watertown, Mass. Later he was a director of its testing laboratory. In 1926 he became associated with the Climax Molybdenum Co., New York, and in 1929 took charge of the research at United States Pipe & Foundry Co. Dr. Langenberg received the Henry Marion Howe gold medal in 1926 from the American Society for Steel Treating. He was a member of the Harvard and Engineers clubs of New York and numerous scientific societies.

Consider Cast Steel at Pittsburgh

"Processing and Properties of Electric Furnace Steel Castings" was the topic at the monthly meeting of the Pittsburgh Foundrymen's association, May 17, in the Roosevelt hotel, Pittsburgh. Ray J. Wilcox, metallurgical engineer, Michigan Steel Casting Co., Detroit, was the speaker. Mr. Wilcox discussed electric furnace practice, sand practice, carbon steel castings, structural or mild alloys, and heat and corrosion resisting castings. His talk was illustrated by lantern slides.

The speaker stated that at his plant acid practice is used for carbon steel and mild alloys and basic practice at present for the highly alloyed castings. By high alloys he referred to materials in which nickel or chromium are present in amounts exceeding approximately 12 per cent. Sand practice at that plant consists in the use of reconditioned sand almost exclusively for green sand and dry sand molding. A system of facing and backing sand is employed. Facing materials having moisture content of 3½ per cent, permeability of 175 to 200, and shear strength of 2 pounds have been found to work satisfactorily. Mold hardness values are from 85 to 90 in the regular run of green sand work.

Mr. Wilcox then discussed the effect of oil quenching and drawing compared to straight normalizing. He stated physical results obtained from tensile test bars are influenced to a large extent by the size of section cast, temperature of pouring, and location of test specimen. In the field of mild or structural alloy steel casting, the use of man-

(*Concluded on page* 95)

The World's FIRST

Free Wheeling

with the DOUBLE EIGHT VIBRATION MOVEMENT

RIDDLE

ADAMS' FAMOUS FOUNDRY PRODUCTS

Backed by 22 years of successful vibrator and riddle experience. Built for service, fully Guaranteed. They make REAL MONEY for you!

A Great Step Forward in Foundry Efficiency

A Universal Portable Riddle that will earn its way in any foundry. The new "Free Wheeling" principle eliminates excessive bearing wear, insuring smooth operation and more effective vibration. The unique "Double-8" vibration movement (a throwing-chopping-riddling action) insures a better mix and temper to your sand . . . faster and better sifting, less time per batch, less cost per job. Improved Riddle weighs only 70 lbs., so that one man *actually can* handle it easily and hook it up anywhere. Overall height only 30 inches—permits sieves to be quickly tilted and dumped without being removed. Can be used with any foundry sand.

10 DAYS FREE TRIAL—PRICE

$150.00

f.o.b. Chicago—115 volt A.C. single phase, 60 cycles. For D.C. and 3-phase motors up to 230 volts, $7.50 extra.

NOW—the Universal Riddle equipped with a new all-steel bottom, with sifting cloth mounted in a special ring and instantly changeable.

"RED" ELECTRIC VIBRATORS

Representing the biggest Value in Foundry Vibrators ever offered . . .

They more than pay for themselves in a single day's time . . .

Lowest Operating Cost. Adaptable to any Foundry Plant . . .

They give cleaner Draws, faster Production, better Molds, better Castings, and Lower Costs.

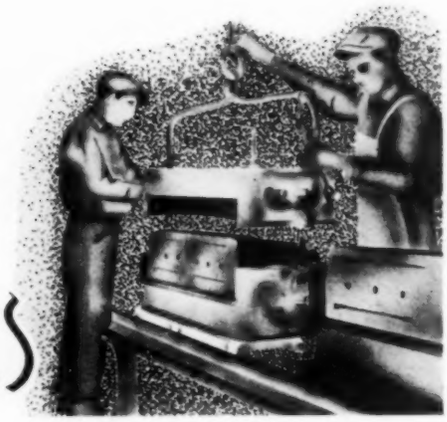
Price—f.o.b. Chicago

No. 1—for Light Match Plate Work	$10.00
No. 2—for Medium Match Plate Work	13.00
No. 5—for Heavy Match Plate, Tub and Bench Work	17.00
No. 9B—for Machine and Heavier	24.00

FOUNDRY SUPPLIES MFG. CO.

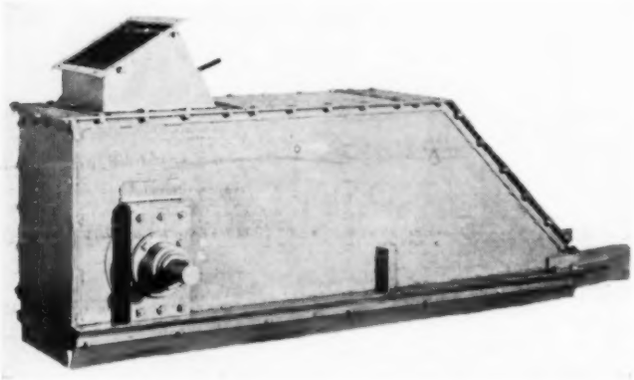
2221 Orchard St.
Chicago Illinois

NEW EQUIPMENT for FOUNDRIES



Unit Throws Sand On Rotor Blades

Eastern Corp., Graybar building, New York has developed an aerator and sand conditioner for use in foundries to produce an open fluffy sand. Shown in the accompanying illustration, sand enters at the top of the casting and impinges on renewable wearing blades of a high velocity rotor. At the same time a large regulated volume of air is introduced through the rotor, aerating the sand as it is thrown from the rotor blades.



A special type of sand seal insures contact with the conveyor

The casing is equipped with a removable inspection plate, angular adjustment gates, self aligning, dust proof roller bearings and, when used with a belt conveyor, a special type of sand seal which insures contact with the conveyor. It is driven by a V-belt.

Combine Light from Two Lamps

Benjamin Electric Mfg. Co., Des Plaines, Ill., has combined the light from one 250 watt mercury lamp and either one 300 watt or two 150 watt incandescent lamps to form a new combination lighting fixture. The result is a mixture of the yellow-green light rays of the mercury lamp and the predominantly red rays of the incandescent lamp. Two types are available. Combination diffusers enclose the lamps within an opal glass diffusing globe, with apertures in the top to allow approximately 10 per cent of the light to reach the ceiling. Combination dome reflectors have the same hood construction as the diffusers but employ a deeper dome-type reflector which is closed at the bottom by a stippled-glass dust tight cover to prevent cool drafts.

Castings Cleaned On Conveyor

Pangborn Corp., Hagerstown, Md., has introduced a rotoblast rocker barrel which, it is claimed, is designed for flat, mixed, long and fragile work as well as the usual sizes and types of gray iron, steel, alloy and malleable castings. The barrel consists of the rotoblast unit, folding conveyor drum, abrasive cleaning system and control mechanism. The blast unit is mounted on top of the cabinet above the drum center in such a position that the wheel and blast stream are parallel with the axis of the drum.

The drum consists of two heads and a cylindrical portion of the shell. Folding conveyor sections are hinged to the shell proper, which is lined with abrasive resisting wear plate. The head is lined with three thicknesses of abrasive resisting liners. Each conveyor section consists of three flights made up of special abrasive resisting cast steel and an end flight of abrasive resisting plate, all assembled with chain connecting links. Flights are replaceable without disconnecting the conveyor. The drum is supported on two enclosed ball and roller bearing trunnions.

An automatic abrasive cleaning system, built integral with the machine, consists of a series of screens which remove the coarse refuse. The screened material, abrasive, fines and dust, flows over inclined stratification plates which take out the dust and fines. The cleaned abrasive flows to the storage bin.

All mechanical operations are manually controlled through centralized push buttons and a lever located on the left side of the machine. A view of the unit is shown in the accompanying illustration.

The blast unit is mounted at the top of the cabinet

Bench Grinder Is Portable

Black & Decker Mfg. Co., Towson, Md., has developed a 6-inch ball bearing bench grinder designed for practical shop use. The unit is equipped with full ball bearings which are protected against dust and dirt by special bearing sleeves. Wheel guards are strengthened by use of an alloy which is said to combine lightness with high tensile strength. The grinder may be bolted to the bench or moved to convenient locations by the carrying handle.

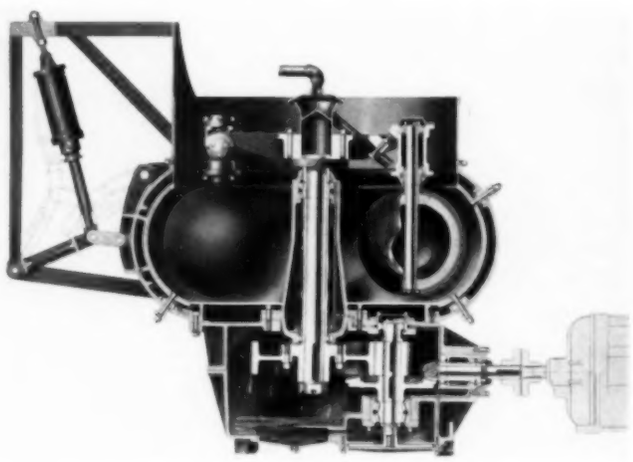
Designs Muller for Foundry Sand

Beardsley & Piper Co., 2541 North Keeler avenue, Chicago, has developed a foundry sand muller designed to use centrifugal force in the preparation of the sand. A sectional view of the muller is shown in the accompanying illustration.

The mulling mechanism consists of a cross head mounted on a vertical shaft revolving at 90 revolutions per minute. From this cross head, two 20-inch diameter, rubber-covered spherical mullers are supported pivotly to swing outward by centrifugal force. The mullers are adjustable as to throw. The cross head is equipped with two outside and two inside plows for delivering sand outwardly, inwardly and upwardly, and for holding the sand in suspension in the path of the mulling balls and the spherical side walls of the bowl. This delivers the sand of the batch into the muller track area and subjects it to approximately two mulling and four aerating actions per revolution.

The reduction gear unit is built integrally into the base of the machine to allow for direct connecting to a 50 horsepower, 1800 revolutions per minute motor without the additional speed reducing equipment. It is claimed the muller will deliver 10 cubic feet of mulled sand every 1 1/5 minute or 25 tons per hour at an average consumption of 2 horsepower per ton of sand mulled per hour.

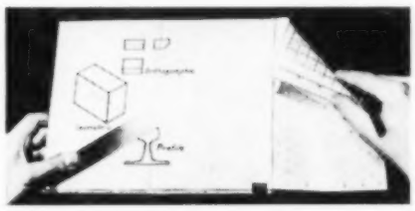
The muller is equipped with anti-friction bearings which have adjustments readily accessible. The unit occupies a floor space of 6 x 13 feet, including the motor.



The mulling action is aided by centrifugal force

Sketch Pad Set

Ward Instrument Co., Cleveland, recently has placed on the market a sketch pad set for taking any type of sketch to any scale. The set consists of a pad of strong tracing paper; a cellulose covered buff colored guide plate that slides under the top sheet of the pad and is printed in blue ink showing ⅛-inch squares, every ½-inch line heavy and every 1-inch line numbered. On the other side an isometric design with all three axes divided 1 inch, ½ inch and ¼ inch so that drawings showing all six sides and interior may be made to any scale. A steel straightedge also is provided. The pad has a stiff back and is sealed at top with padding cement and at the bottom with strips of re-usable drafting tape which prevents shifting. Pads are made in three sizes: 200 sheets 5½ x 8½ inches; 100 sheets 8½ x 11 inches; 50 sheets 11 x 17 inches.



The guide plate slides under the top sheet of the pad

Shop Microscope

A shop microscope for detail examination of casting defects, foundry sands, machined parts, etc., and shown in the accompanying illustration, recently has been placed on the market by the Harry W. Dietert Co., 9330 Roselawn avenue, Detroit. The instrument has been designed and manufactured especially for shop use. Specifications include: Net weight 5 pounds, height 10 inches, electric current 110 or 220 volts, magnification 30 X is standard, but 20 X or 40 X may be supplied if necessary. Standard equipment includes a 32-millimeter achromatic objective and 7.5 X Huygenian eye piece. 5 X and 10 X also are available. The microscope is equipped with an erecting prism so that the object viewed is seen in erect position. It is claimed that the instrument will work in any position, is easy to focus and the surface of the object to be examined need not be finished or polished.

Microscope is equipped with a prism so that the object is viewed in erect position

Develops Group of Refractories

A comprehensive group of 11 insulating refractories, made from a new calcined fire clay base material of minute cellular structure, has been developed by the Quigley Co., 56 West Forty-fifth street, New York. The products, available in block, brick, plastic and castable materials, are said to possess the properties of light weight and low heat storage capacity.

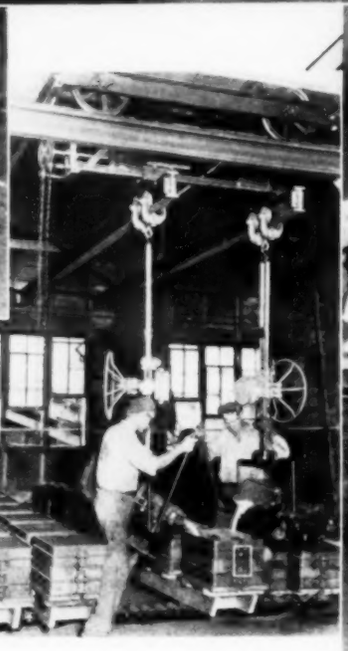
The company's insulating fire brick, for service temperatures up to 2600 degrees Fahr., has been developed for heat treating, annealing and other types of fuel-fired and electrically heated furnaces, as well as waste heat boilers, flues, oil stills, core ovens, baking ovens, etc.

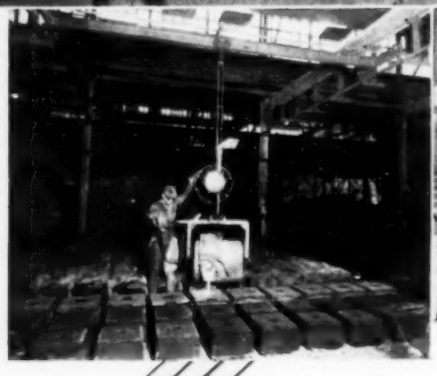
APPLY *Modern* SEALED HEAT

The "Talk of the Convention"

in your foundry!

Patents Applied For





With the approach of hot weather, this equipment will pay you quick dividends. Above illustrations show you how **"Modern Sealed Heat"** and pouring equipment installations save time, operating cost, scrap, **and the operator.**

Write today for further details.

MODERN EQUIPMENT COMPANY

DEPT. 131
PORT WASHINGTON, WIS.

MODERN EQUIPMENT CO.

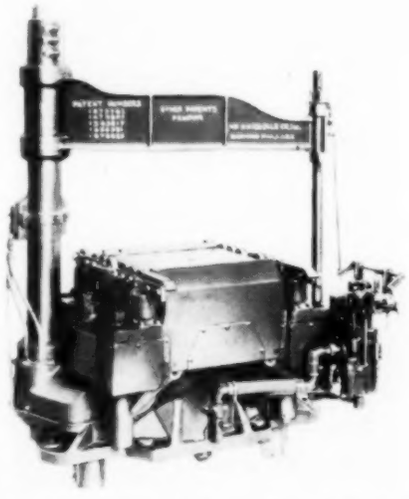
Molding Machine Is Nearly Automatic

A combination jolt and power squeezer machine with pattern drawing device and equipped with an adjustable flask roll-off to take flasks of various lengths, as shown in the accompanying illustration, has been developed by the Wm. H. Nicholls Co. Inc., Richmond Hill, Long Island, N. Y., to meet the requirements of the continuous conveyor system of the mass production foundries.

After the operator has placed the flask in position and filled it with sand from the overhead hopper, the machine movements are governed automatically by an air operated main valve. A jolt counter shuts off the jolt line after a certain predetermined number of jolts. The number can be set anywhere between 4 and 12 to suit sand conditions, etc. Once set, the jolt timer will always give the same number. As soon as the jolting ceases, the squeeze head swings in automatically and the valve turns to squeeze. Pressure in the squeeze cylinder is regulated by an adjustable valve. As soon as the cylinder has reached proper pressure, the main valve turns back to neutral. The squeeze piston goes down with the pattern plate while the lifting frame carrying the mold remains supported by latches thrown in by air.

Toward the end of the pattern draw, wheels raise the mold to even level with a conveyor. As the finished mold is pushed off on the conveyor the cross arm automatically swings back and the cycle is repeated. Properly supplied with sand and flasks it is claimed the machine will deliver finished molds to the conveyor at the rate of three or four per minute. If necessary the automatic features may be disconnected and the machine may be operated by a handle on the main valve. The machine may be adjusted for flasks of various lengths by moving the lift pin bushings.

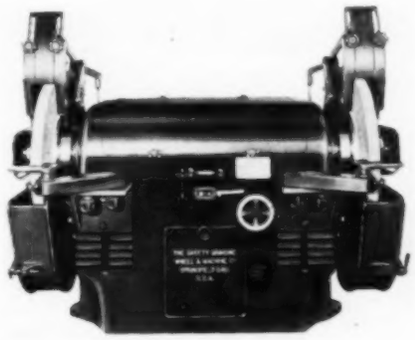
Solidly built and provided with a pressure lubricating system, all working parts are fully protected from sand and dust. To insure pattern drawing precision the flask remains dowelled on the lifting frame while the pattern plate moves on four hardened steel pins working in hardened bushings.



All movements, jolting, squeezing and pattern draw are controlled automatically from one main valve at the right

Changes Compensate For Wheel Wear

Safety Grinding Wheel & Machine Co., Springfield, O., has introduced a new floor type grinder which provides an infinite number of gradual increases of speed as the wheels wear away. This makes it possible to maintain the peripheral speed at all diameters throughout the range provided. The change is accomplished by turning a hand wheel. Features claimed are longer wheel life, higher grinding rate, safe operation and easy efforts by the operator.

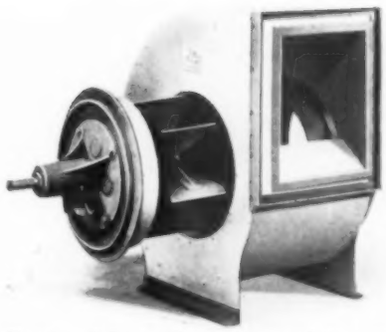


The change is accomplished by turning a hand wheel

The grinder is made for 30 inch and 24 inch diameter wheels and uses alternating current motors.

Exhauster Made in Several Sizes

Industrial Gas Engineering Co., 201 East Ohio street, Chicago, has developed a new line of high temperature exhausters. These embody numerous changes in design and are made in a wide range of types and sizes for various temperatures. They are available with double housing insulated and air cooled construction and also with a single housing uninsulated construction for applications where that type of equipment is satisfactory.



Heat resistant alloys are used in some parts for high temperature work

Parts subjected to high temperatures are fabricated of various heat resisting alloys. Double row self-aligning ball bearings are used and these are kept cool by a method which prevents transmission of heat from the shaft to the bearings.

Pittsburgh Meeting

(*Concluded from page* 90)

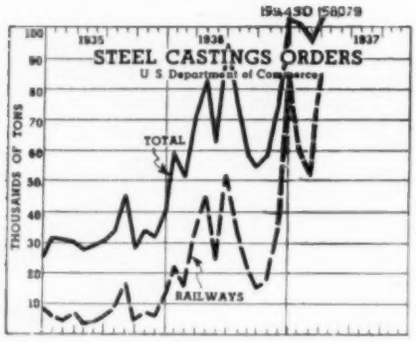
ganese and silicon in amounts exceeding those normally present, either separately or combined, together with suitable carbon contents, produce desirable combinations of moderate strength and suitable ductility after simple heat treatments.

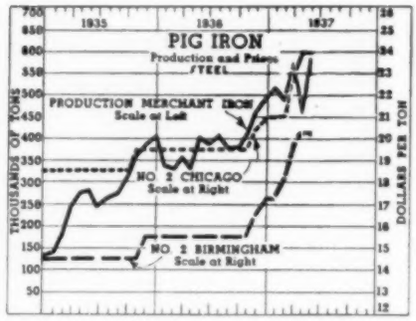
Concerning the casting of heat and corrosion resisting alloys, Mr. Wilcox said the corrosion resisting alloys require heat treatment to develop maximum resistance to corrosion. For severe conditions, the chromium-nickel alloys find large usage, wherein heat treatment usually consists of cooling the alloy rapidly from temperatures in the range of 1900 degrees Fahr. to 2100 degrees Fahr. Notable in this series of alloys is the 29 per cent Cr-9 per cent Ni alloy, which has been found to give excellent performance in the as cast condition.

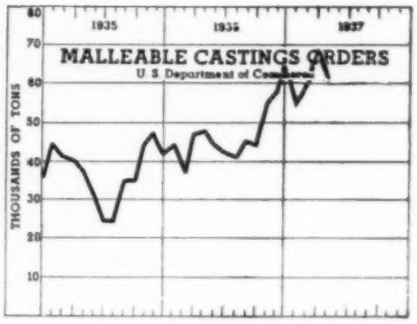
The leader of discussion was DuRay Smith, Union Spring & Mfg. Co., New Kensington, Pa.

Officers nominated by the nominating committee, whose names appeared in the May issue of THE FOUNDRY, were elected by unanimous vote. W. H. White, the retiring president, expressed thanks for the co-operation he had received during the past year.

The annual outing of the Pittsburgh Foundrymen's association will be held June 21 at Wildwood Country club. An extensive program has been arranged, including golf, baseball, tennis, horseshoes and swimming. A banquet will be held at 6:30 p. m.







FOUNDRY ACTIVITIES

A GRAY iron foundry having 260,000 square feet of floor space and a capacity of 300 tons of castings per day, will be included in the new $4,000,000 plant to be built at Indianapolis by the International Harvester Co., Chicago. The new plant, which is scheduled to begin production of truck engines by Feb. 1, 1938, will have an initial manufacturing capacity of 700 engines per day and will employ over 3000 men. Concentration of truck engine manufacture at Indianapolis is not expected to make any substantial change in present employment at the Harvester company's tractor works at Rock Island, Ill., or its truck plant at Ft. Wayne, Ind. Present facilities at the Rock Island works will be used for the increased manufacture of tractors. Sydney G. McAllister is president of the International Harvester Co.

* * *

C. A. West Foundry Co., Camden, N. J. recently has been incorporated. Meyer L. Sakin is agent.

* * *

Arcade Malleable Iron Co., Worcester, Mass. recently has acquired the Albany Malleable Iron Co. plant in Voorheesville, N. Y., where reconditioning work is underway. The plant, which had been closed for many years, is expected to employ about 100 men and will be known as the Voorheesville Casting Co. Inc.

RAW MATERIAL PRICES
June 8, 1937

Iron	
No. 2 foundry, Valley	$24.00
No. 2 Southern Birmingham	20.38*
No. 2 foundry, Chicago	24.00
No. 2 foundry, Buffalo	24.00
Basic, Buffalo	23.00
Basic, Valley	23.50
Malleable, Chicago	24.00
Malleable, Buffalo	24.50
Charcoal iron, furnace	27.00
Coke	
Connellsville beehive premium	$ 6.00 to $ 6.50
Wise county beehive coke	5.50 to 6.50
Detroit by-product delivered	11.10
Scrap	
Heavy melting steel, Valley	$18.50 to $19.00
Heavy melting steel, Pitts. (dlv.)	18.50 to 19.00
Heavy melting steel, Chicago	16.50 to 17.00
Stove plate, Buffalo	14.50 to 15.00
Stove plate, Chicago	11.50 to 12.00
No. 1 cast, New York	14.50 to 15.00
No. 1 cast, mchy, Chicago	15.00 to 15.50
No. 1 cast, Pittsburgh	18.75 to 19.25
No. 1 cast, Philadelphia	19.00
No. 1 cast, Birmingham	14.50 to 15.00
Car wheels, iron, Pittsburgh	20.00 to 20.50
Car wheels, iron, Chicago	19.50 to 20.00
Railroad malleable, Chicago	19.50 to 20.00
Malleable, Buffalo	20.00 to 21.00
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	13.75
Straights tin	56.12½
Aluminum, 99 per cent	20.00
Aluminum, No. 12 (Secondary, standard)	19.00 to 19.50
Lead, New York	6.00
Antimony, New York	14.75
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	6.75

*Where phos. is 0.70 and over deduct 38c.

McLanahan & Stone Corp. (Gaysport Foundry), Hollidaysburg, Pa. has been in the foundry business for over 100 years, having been organized in 1835.

* * *

Arcade Malleable Iron Co., Worcester, Mass., held its annual bowling league banquet on May 8 at the Aurora hotel, Worcester. Henry P. Blumenauer, president and Frank D. Brisse vice president, spoke.

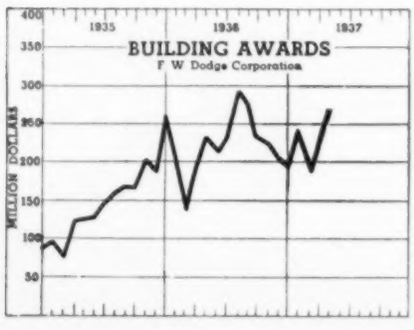
* * *

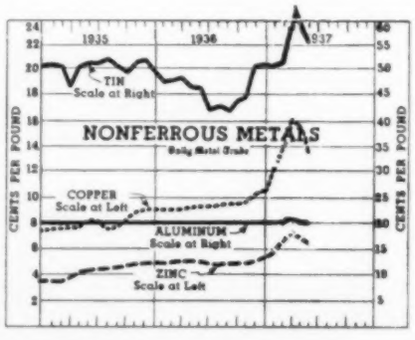
Lunkenheimer Co., Cincinnati, is building a storage space for foundry supplies and flasks on one foundry bay. This will permit the handling of materials and flasks by crane.

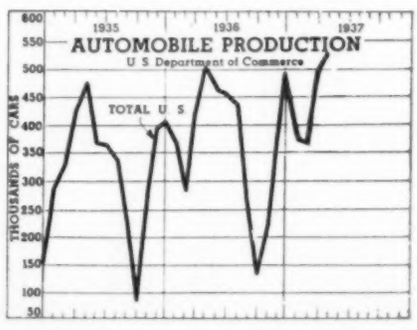
* * *

Crawford Steel Foundry Co., Bucyrus, O., recently organized to produce open hearth steel castings, is installing a 10 ton open hearth furnace which is expected to be completed in 12 weeks. Officials of the new concern are: Walter J. Michael,

(*Concluded on page 98*)







SAID ONE SUPERINTENDENT TO THE OTHER—

"I Cut Operating Costs with Milwaukees"

"After seeing those brand new machines demonstrated at the Milwaukee Foundrymen's Convention, I realized the necessity of MODERNIZING my plant. I just couldn't afford to plod along with such old, obsolete equipment.

"So I bought Milwaukee molders. They surely are modern in every sense of the word — faster, more rugged machines, and so easy to operate. They reduce my unit mold cost to a minimum by making accurate, uniform molds with the fewest manual motions. This enables me to meet stiff competition.

"Bill, take my word for it. Those Milwaukee Molders will soon pay for themselves."

Write for Literature

No. 214 MILWAUKEE JOLT SQUEEZING STRIPPER removes mold automatically.

MILWAUKEE FOUNDRY EQUIPMENT CO.

3238 WEST PIERCE STREET • Cable Address "MILMOLDCO" • MILWAUKEE, WISCONSIN

(*Concluded from page* 96)

president; Frank D. Glosser, vice president; and John C. Carroll, secretary-treasurer.

* * *

American Brake Shoe & Foundry Co., New York, has consolidated the American Forge Co. and the Southern Wheel Co. with the parent concern. Those are now known as the American Forge and Southern Wheel divisions, respectively. Consolidation of certain other subsidiaries and their organization as divisions will take place as soon as practicable. In line with the program, the Brake Shoe division has been created recently. That division produces, in addition to brake shoes, miscellaneous iron castings. Maurice N. Trainer, vice president, has been placed in charge. The American Brake Shoe & Foundry Co. of California has established general offices at 1010 Russ building, San Francisco.

* * *

Electric Alloy Foundry Co., Houston, Tex., will be placed in operation soon by James V. Reich, 5034 Rusk avenue, Houston. The company will specialize in heat and corrosion resisting alloys, high test cast irons and miscellaneous alloy steel castings.

* * *

John Deere Spreader Works, East Moline, Ill., Carl H. Gamble, manager, has awarded contract to Jens Olesen & Sons Construction Co., Waterloo, Iowa, for erecting a 1-story foundry, 72 x 260 feet, a 2-story service building, and a 1-story core building. Estimated cost $100,000.

* * *

Index of foundry equipment orders for April, according to a report of the Foundry Equipment Manufacturers' association, Cleveland, was 208.1 as compared with 293.2 for March and 134.0 for April, 1936. Index of shipments was 232.5 as compared with 285.6 in March and 105.1 in April, 1936.

* * *

Acme Aluminum Foundry Co., 6831 South Bell avenue, Chicago, has purchased 15,000 square feet of floor space at 6724 South Chicago avenue for use as an additional aluminum foundry. This addition has been made necessary due to the large increase in sales of the Acme company.

* * *

Riddlesburg, Pa., stack of the Colonial Iron Co. resumed operations early in May for the production of pig iron. Officers of the company are: George P. Pilling, president and treasurer; W. D. Norman, vice president and secretary; and W. C. McKee, general manager. Hickman, Williams & Co. are exclusive sales agents for the production of that company.

* * *

Output of iron and steel castings during April decreased 6 to 10 per cent from that of the previous month in the Philadelphia Federal Reserve district, according to a report received from the industrial research department, University of Pennsylvania. Despite the decrease, production for April, 1937, was approximately double that of the corresponding month a year ago.

* * *

Seward Foundry Co., Bloomington, Ind., will celebrate this fall one hundred and eighteen years of continued service. The concern was founded Sept. 14, 1821 by Austin Seward to make cutlery, guns, stoves and other articles. During the Civil war the Seward company manufactured war equipment and in the eighties the foundry built chilled plows. Fred and Austin Seward, the founder's descendants, now own the foundry which does repair and jobbing work.

D. S. M.
CORE BAKING OVENS

Selecting the right type of baking oven should of course be determined largely by your conveying or handling problem.

The conveyor and coremakers shown above are directly under a three pass horizontal continuous D.S.M. oven, 165 ft. long, in a large automotive foundry in Flint.

The monorail conveyor is loaded as it travels past the coremakers who are working at both sides of the conveyor. This oven is baking the output of between 30 and 40 coremakers. The product is uniform, whether loaded on the top tray or the bottom one. Small pin cores weighing about ten to the pound are baked on the same carriers which convey ten or twelve pound cores—and without burning or over baking. This is a result of proper air conditioning.

We advocate vertical ovens wherever practicable. But for certain core room layouts the overhead horizontal oven fits better.

DETROIT SHEET METAL WORKS
DETROIT - - MICHIGAN
1270 Oakman Boulevard

It requires less

PRESSURE

and less

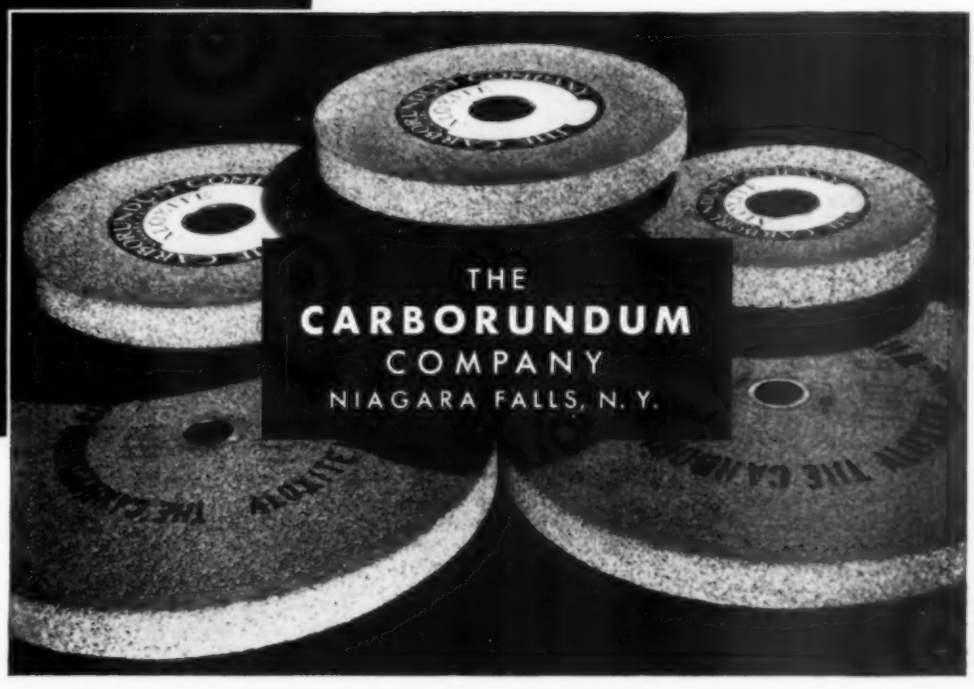
DRESSING

HERE is a wheel that operates effectively, efficiently at extremely low grinding pressures, because of its structure, the high cutting power of the special abrasive, its sharpness and its self-sharpening characteristics. This wheel practically eliminates the loss or wasting of usable abrasive by too frequent dressing.

Because it has a continuous breaking down action it keeps up to maximum sharpness. Yet the breaking down action is slow enough to assure low wheel costs.

Try this great wheel on steel, malleables, certain classes of semi-steel and hard irons, if you want low wheel costs, increased production and decreased operator fatigue. It is setting new unprecedented production records.

ALOXITE
REG. U. S. PAT. OFF.
BRAND
"180 Bond" Foundry Grinding
WHEELS
(VITRIFIED)



Sales Offices and Warehouses in New York, Chicago, Cincinnati, Boston, Philadelphia, Cleveland, Pittsburgh, Detroit, Grand Rapids. (Carborundum and Aloxite are registered trademarks of The Carborundum Company.)

NEW TRADE PUBLICATIONS

Copies of any of the literature listed below may be obtained by writing directly to the companies involved, or by addressing THE FOUNDRY, in care of Readers' Service Department, 1213 West Third Street, Cleveland

ELECTRIC FURNACES — Ajax Electrothermic Corp., division, Ajax Metal Co., Trenton, N. J., has prepared a bulletin describing its coreless induction furnaces for melting ferrous and nonferrous metals. The company's method of holding power on the furnace while pouring is shown, as well as illustrations of new internally cooled capacitor units. A new schematic wiring diagram is given, larger melting furnaces are listed and knife contacts and flexible leads are illustrated. An extended list of United States furnace installations by the firm is included.

CASTINGS — Straight Line Engine Co. Inc., South Geddes street, Syracuse, N. Y., has prepared a folder on its facilities, showing different production jobs in gray iron and semi-steel castings.

INDUCTION MOTORS — Fairbanks, Morse & Co., 900 South Wabash avenue, Chicago, has issued a new bulletin descriptive of its line of polyphase wound-rotor or slip-ring ball bearing induction motors. Frame, stator, rotor, collector rings and ball bearings of the units are fully presented in detail.

DRAFTING — Wade Instrument Co., 2274 Brooklyn station, Cleveland, has issued a folder showing a new sketch pad of tracing paper with a guide sheet with isometric pattern on one side and ¼-inch squares on the other; a new adjustable irregular curve; and other drawing instruments, blue print papers and tracing papers.

BLOWERS — Ingersoll-Rand Co., 11 Broadway, New York, features in a recent catalog an illustrated discussion of its single-stage motor blowers, with information on the theory of centrifugal air compression to pressures up to 3 pounds. The booklet also contains a section covering the seven major fields of motor blower applications.

HOISTS — McCollum Hoist & Mfg. Co., Downers Grove, Ill., has sent out two illustrated folders. The first gives information on its chain hoists, ¼ to 20 tons, ball bearing and spur-geared, with prices and weights; the second concerns the company's electric hoist, hook type and trolley type, with illustrations and data.

GAS ALARM — Mine Safety Appliances Co., Braddock, Thomas and Meade streets, Pittsburgh, has prepared a new bulletin on its combustible alarm, an instrument for continuously sampling atmospheres where combustible gases and vapors may be present. The unit provides an electrical warning when the concentration of flammable gases exceeds a predetermined limit.

AIR TOOLS — Rotor Air Tool Co., 17325 Euclid avenue, Cleveland, has issued two attractive catalogs. The first gives facts about high cycle electric tools from an engineering, production and operating viewpoint, and presents specifications and diagrams of the company's products. The second gives numerous illustrations of the company's drills, reamers, screw drivers, nut setters, etc., with full details of construction.

RECORDING INSTRUMENTS — General Electric Co., Schenectady, N. Y., has presented a booklet on the improvements made in its portable and switchboard type strip-chart recording instruments for alternating and direct currents. Their applications and complete description of their operation, with details concerning accessories, accuracy, record roll sizes, etc., are included. The company has also issued a booklet entitled "Tips on Cable Uses" which gives the various types of insulated cable produced by General Electric Co., their installation and selection.

FINANCIAL STATEMENTS — Metropolitan Life Insurance Co., 1 Madison avenue, New York, has published an interesting investigation of means used by various companies of interpreting financial statements for their employes. Representative companies are chosen for case examples and the various methods used by them to simplify financial statement language are described. The question and answer method, the condensed statement with explanatory tables, and the chart method with explanation are three of the ways outlined for thorough analysis of this problem.

And Transite Core Plates not only increase production capacity . . . but provide protection against breakage, warpage and corrosion

Johns-Manville TRANSITE CORE PLATES

JM PRODUCTS

THERE'S REAL ECONOMY in using *lightweight* core plates! They make for easier handling . . . step up production . . . and sizably reduce your labor and maintenance expense.

Johns-Manville Transite Core Plates weigh only about a quarter as much as metal of equal thickness. This means that a foundry worker can handle twice as many plates in less time and with considerably less effort.

Transite's other advantages are equally important. Made of a specially treated asbestos-cement combination, these durable core plates cut down on breakage losses. Being non-metallic, they *cannot corrode* . . . they retain their smooth surface year after year. And warping is practically eliminated.

• • •

Send for our Transite Core Plate brochure, containing complete details. Write Johns-Manville, 22 E. 40th St., N. Y. C.